American Machinist

May 19, 1937

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Volume 81 — Number 10

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To HELP You
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ANNUAL MODERN PLANT NUMBER

devoted to International Business Machines Corporation

Only two issues away is another Modern Plant Number of American Machinist . . . this year devoted to one of the outstanding manufacturing successes of the country, International Business Machines Corporation. This is a close-up of a company that has made good, and is making good today, because of its modern and aggressive manufacturing methods. The issue will tell the story in detail:

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Coming on June 16

Talking Shop

Open Covenants

Back in the days of the World War we heard a lot of talk about open covenants openly arrived at. There was something in the idea although some of these covenants did not turn out as well as some people hoped they would. Now the idea has cropped up again in the current contest between employers and labor organizers.

There is no standard method, of course, of conducting negotiations under the terms of that vague practice known as collective bargaining. But this particular method strikes us as having certain advantages. It took place in a plant that had previously had no experience with collective bargaining. Not knowing exactly how to proceed the management decided that it would be a good idea if everybody knew what was said. Consequently, a court stenographer was engaged and the local newspaper reporters were invited in to listen to the negotiations. The management selected 100 employees from all departments as witnesses and invited them to sit in and listen.

With all these attentive and interested observers both sides had to be very careful to confine their claims and contentions to the strict truth because there was sure to be somebody in the audience able to catch any slight deviation from facts.

Of course the local papers carried full stories on the negotiations, but in addition the management sent to each employee on the payroll a transcription of the whole proceedings. One of the unexpected by-products was the discovery by certain irate wives that their bread winners had been stopping on the way home to get the pay check cashed and had then turned over what was left with the inference that that was all that had been paid by the company. The result was a very thorough clearing of the air in certain quarters.

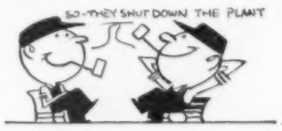
Combining Business and Pleasure

We recently ran across an unusual example of combining business with pleasure. In an exceptionally neat little shop in a small Florida town was a special apparatus assembled on a pool table that served as layout or erecting bench. The level surface of the slate beneath the cloth covering

made a substantial and convenient table and the cushions prevented parts from rolling off the bench. When there was no work—and nearly all small shops of this kind have idle hours at times—the men played pool as a recreation. This advantage was only equalled in the old water-power shops where the men could fish out of the window between jobs.

Factory Drawing Account

With so many companies facing today, for the first time, the probability that they will be dealing with labor leaders and possibly closed-shop conditions, there is encouragement in some of the things that have been accomplished in plants that have operated on a closed-shop basis for a period of time. One such company has an A.F. of L. Union with which it has never had any trouble, but there has been some difficulty with seasonal unemployment. While total income for the year has been enough to meet living requirements, some of the men did not lay up a reserve for rainy days. As a result when layoffs were necessary these



men were forced to drift into other work and sometimes did not come back when jobs were open again.

To meet this problem the general manager suggested to the union that the annual income of the men be averaged up on a 52-week basis and this average paid to them each week whether they worked or not. The actual money received by each man over the annual period is exactly what he earned on his hourly rate, but he is assured of a fixed minimum each week. The offer was made to all employees who had been with the company for more than six months.

In return for these advances the men agreed as a body to guarantee the company against loss incurred through men leaving while they were overdrawn. The amount of the overdraft is borne proportionately by the entire group. Experience with this plan has been successful and there is a marked increase in cooperation between the workers. Although no employee has left the company with a deficit to be shouldered by his fellow-workers, there is every evidence that public opinion in the plant will frown very vigorously if anybody suggests this practice. The manager says that the plan was not inaugurated with any altruistic notions, but was merely a hard-boiled business policy that improved operations through relieving the men of financial worries and thereby assuring the company of a permanent, satisfied working force. —*The Editors.*

When Is a Machine Tool Old?

40-in. dividing engine, old in years but young in usefulness because it is still accurate and is used but little

For purposes of determining the true age of machines, plant equipment may be divided into four classifications:

1. **Machines difficult to replace**
2. **Special machines obsoleted before full depreciation**
3. **Standard machines obsoleted before full depreciation**
4. **Standard machines after full depreciation**

M. E. LANGE
The Warner & Swasey Company
Cleveland, O.

TRUE AGE of *Machines Difficult to Replace*—In 1774 John Wilkinson invented the first boring mill and bored the first cylinders for James Watt's steam engine. There were no large metal working machine tools in those days. The heavy bar, the slide and the feed rack, etc., had to be made by the blacksmith's hammer, the chisel, the file and the straight edge—for in those days these were the only metal working tools.

This machine was precious, almost priceless. It was the culmination of ten years of effort to find a means of boring true cylinders essential for the proper functioning of the steam engine. Such a machine would not become old until utterly worn out, because there was nothing better to take its place.

Even today, there is some equipment which falls into this classification. We have one machine of this sort in our plant—a 40-in. circular dividing engine. Endless hours over a period of many years were spent to bring this machine to its present state of accuracy, the greatest error being one second of arc or a deflection of only 1 in. in approximately 3 mi. Though old in years, this machine is still young in usefulness; and it would be costly indeed to reproduce it with present wage rates. It has not been rendered obsolete by a new machine which could do the same work better or more cheaply. Therefore, this machine, though old in years, is not "old" from the standpoint of good shop practice and is not in need of replacement.

True Age of Special Machines Obsoleted Before Full Depreciation—To improve production methods and cut shop costs of parts used extensively in a fundamental industry, a certain manufacturer bought specially designed automatic machines. Estimates showed that over a ten-year depreciation period, costs could be absorbed and a good profit earned.

But buying these machines proved a mistake in judgment. Long before the ten years were up a competitor worked out a method of making the same product by the application of special tools to standard machine tools, which made a cut in selling price possible.

The owner of the special automatic machines was in a predicament. He found that his machines could not be speeded up without costly design changes, and therefore work produced on them could no longer compete with the new market situation. The equipment had five more years to run before being fully depreciated. However, any alteration would add just that much more to the book value and result in increased depreciation charges. With these facts before the management, it was finally decided to write off the machines as a total loss and install new standard high-speed hand-operated machines.

Rate of productivity is another factor which has an important bearing upon the "age" of special machines. Take a machine, for instance, geared up to handle production of a standard item at the rate of 100,000 a month—with production costs calculated upon that basis. If orders dwindle to 20,000 a month, the machine cannot earn its keep. Similarly, if instead of being a strictly standard item the order in question may come in the form of twenty lots of 5,000 each, with varying specifications in each lot, the special machine may not

earn its keep because of the cost of making adjustments for various lots.

True Age of Standard Machines Obsoleted Before Full Depreciation—The true age of a standard machine is purely a matter of comparison to other machines available for the same work. This is the case even though the machine may not be "old" in years and only partly depreciated on the books.

I believe this fact can best be illustrated by giving a typical instance from the experience of our company:

One of our customers had in operation an engine lathe 6-½ years old, 65 per cent depreciated and in good condition.

Productivity and cost of operation of this machine were compared to those of a modern Warner & Swasey turret lathe. The comparison developed the above figures.

Time on engine lathe	230	minutes
Time on turret lathe	48	"
Saving per piece	182	"
The turret lathe cost		$2685.00
Second-hand value of old machine ($2000 depreciated 65%)		700.00
Net added investment in machine equipment		$1985.00
Standard and special tool cost		2808.00
Total added investment		$4793.00
Production per day of 16 hr. (2 shifts) on the turret lathe, using 48-min. hour to allow for tool changes, etc. $\frac{48 \times 16}{48}$		16 pieces
Saving per day—16 pieces x 182 min., or 48.5 hr. With labor at 60c, 48.5 x 60		$29.10
Savings per year—$29.10 x 280 days		8148.00
From this deduct $2808, total cost of tools the first year, plus $397.00, representing 20% depreciation on $1985.00, the additional investment in new machine equipment		3205.00
Net saving or earning on investment		$4943.00
Earning power of additional investment in new equipment was: $4943 (the net saving) / $4793 (the additional investment)		103.1% per year

It is interesting to note that the tool equipment on the new turret lathe actually cost more than the actual investment in the turret lathe itself. Yet in spite of that fact, the earning power of the new lathe remained extremely high by comparison to the engine lathe.

Actual results proved out even better than the estimates. Replacement of the old engine lathe by the new turret lathe paid 145.2 per cent on the investment during the first year.

This illustration speaks for itself. Obviously, the engine lathe was old although neither worn out nor fully depreciated.

True Age of Standard Machines After Full Depreciation—In our plant we have perhaps a dozen machines that although fully written off and hence theoretically "old" can still hold their own in comparison with new modern machines. For instance—we have a very accurate gear cutter of large capacity over 40 years old, which is used for telescope and instrument work perhaps a dozen times a year. It is still in excellent shape and apparently will be good for another 40 years. The point is that it is still perfectly adequate for the small volume and the accuracy of the work to be done on it, and comparisons with other available machines do not indicate any profit to be gained by replacement.

What I wish to point out is that even in cases where productivity and production costs may not be a deciding factor, the quality of the work done may determine the need for replacement.

To illustrate—suppose a plant that has a limited quantity of turret lathe work possesses a Warner & Swasey old style turret lathe. The volume alone of turning work to be done might not be sufficient to justify the purchase of a new turret lathe. But the machine, after years of service, cannot turn out work of the quality needed to meet today's rigid specifications.

The old machine will continue to function with the small productivity required of it—it will continue to turn out the work—but its deficiencies, after years of operation, by comparison with the new turret lathe available today, are such that it cannot turn out a quality product. Therefore, if for no other reason, the old machine should be replaced.

The question arises—why not repair the old lathe?

It can be repaired, but only to a certain extent. Repairing cannot alter the spindle bearing, or the power capacity, or change the square turret design—to cite only three vital points.

And after repair, what do you have? You still have just another old turret lathe which lacks the power, rigidity, ease of operation and maintained accuracy needed to turn out products of the quality demanded today.

What is the Best Plan to Determine Machine Age?—Invention and research march day by day. What is good today may be old tomorrow. Nothing in industry stands still. The replacement problem, therefore, is not one which can be suddenly attacked, settled and forgotten. It is an ever present proposition, and must be approached with a reasonable degree of frequency.

The only thorough-going method of determining the age of machines in a plant is to make a periodic survey of the entire machine set-up, analyzing the actual performance of each machine in the light of the work which it has to do, by comparison with possible performance of present day models capable of doing the same kind of work.

Laboratory Never Right

USUALLY laboratory productions are on too small a scale for commercial interest, but in the case of tungsten carbide, the pieces were much too large! In the 1890's Moissan, a noted French scientist, produced a compound of tungsten and carbon. It was in such massive form and was so brittle and fragile that it seemed of no use and took its place on the shelf of scientific curiosities. When a German scientist in the 1920's reduced these large pieces of tungsten carbide to a fine powder, added metallic cobalt powder and formed the mixture into briquettes, commercial cemented carbide became a reality.

Economy in

Production Molding

Plastic parts, with and without metal inserts, are being made by the Boonton Molding Company in a great variety of sizes and color

HERBERT CHASE

STARTING with a few presses in space rented in one corner of its present plant in 1922, the Boonton Molding Company has grown until it now has some 60 presses, occupies the whole plant (to which an entire second story has been added) and has paid for a large proportion of this out of earnings, including acquisition of the plant itself from its original owner. Almost the entire ground floor of the main building, which has about 6,000 sq.ft. of space on this floor, is given over to the molding department. In smaller adjacent buildings are a steam power plant, including the necessary hydraulic pumps and a department for storing and preforming materials used in molding. The second floor of the main building is used for cleaning, inspection, polishing and packing.

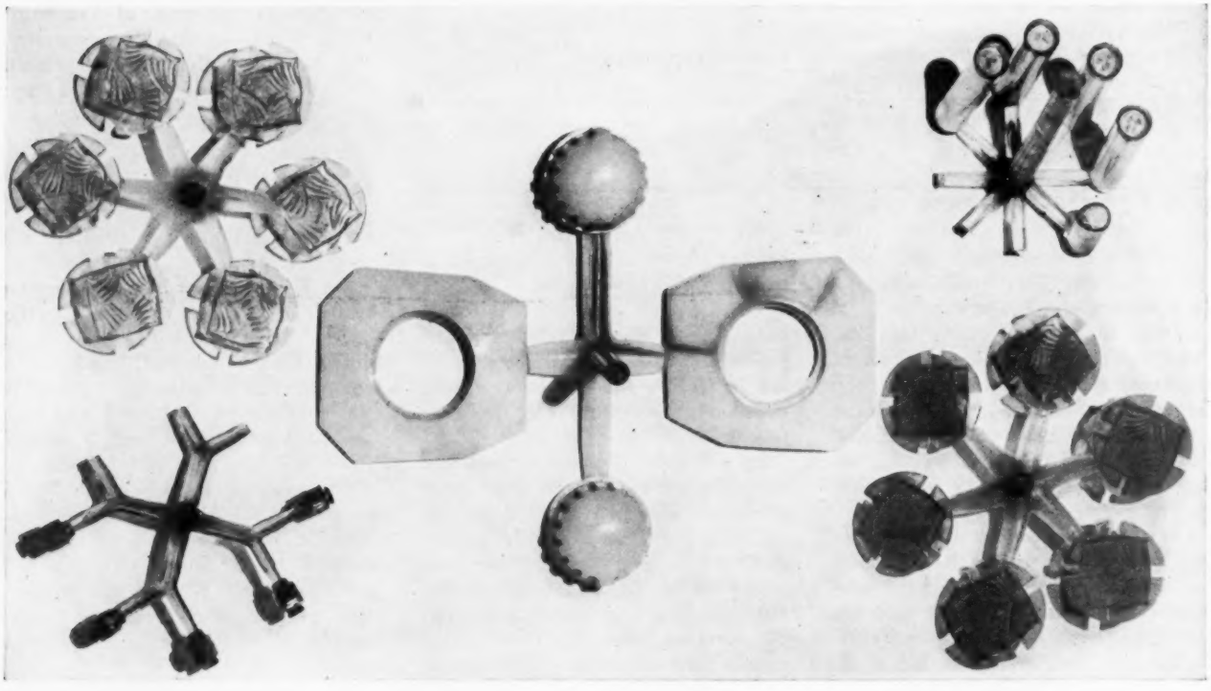
Unlike many molding plants, this one does not boast of an extensive toolroom for the production of molds. The investment in equipment for mold making, which is expensive and seldom in full use, adds considerably to overhead as does the carrying of numerous toolmakers. Instead, all molds are purchased from outside shops specializing in mold production and well equipped both to design and to build molds at reasonable prices. Molds are available quickly when wanted, especially as the plant is a good and continuous customer of outside shops which consequently give excellent service. Only enough machine tools are provided in the molding plant to make emergency repairs and for such maintenance of presses and other equipment as may be needed under normal conditions.

Another factor in economy is the policy of running the molding shop continuously 24 hours a day (four shifts), except Sundays, even when business is slack, as there are always some customers who want maximum production.

Shifts Vary With Sales

Incidentally, to keep labor turnover down, a variation from four six-hour shifts to three eight-hour shifts is made as the demand changes. When production demands drop, employees

Molded parts of cellulose acetate are made from heat-softened viscous plastics which are forced into cold molds usually having several cavities



are divided into four six-hour shifts. When demands require that more machines operate, a swing to eight-hour shifts is made. This gives a flexibility in man power of 33 per cent at any time. It helps to keep equipment busy, but avoids the delays and expense of having steam up and down and waiting for presses to warm after they have become cold. It also facilitates quick deliveries which are appreciated by customers many of whom wait until a supply of moldings is nearly exhausted before ordering a new lot.

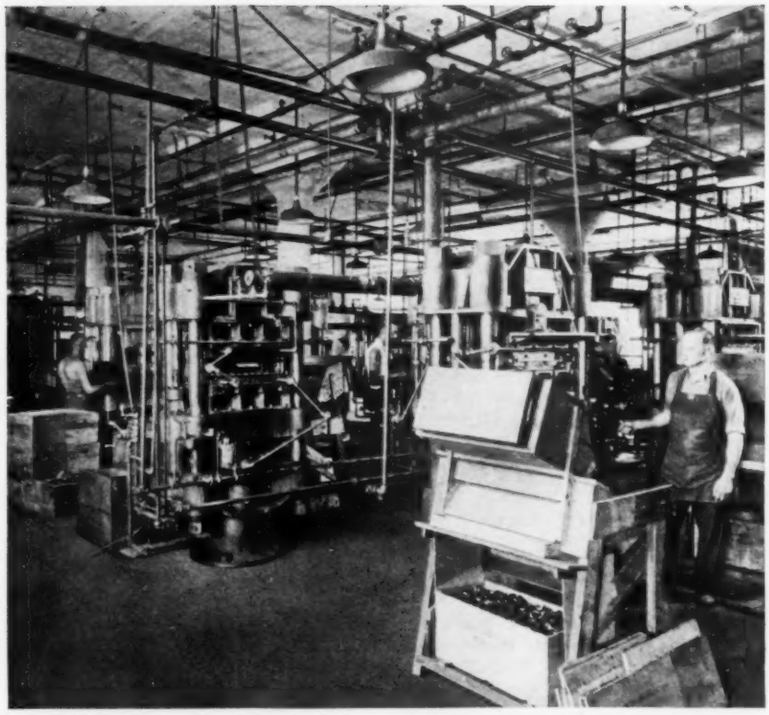
All molding compounds entering the plant, which are purchased ready for use from the important suppliers, are delivered in drums to the stockroom. There the drums are raised by an electric hoist to racks of angle iron, the beds of which are slightly inclined so that the drums roll by gravity toward the unloading end. There are, of course, separate racks for the various grades, types and colors of compound employed. Some 80 per cent of all compounds used are tabletted or preformed; a battery of several preforming machines, with a weekly capacity of 12,000,000 pills, is located at one side of the storeroom where the machines can be kept charged readily with the type of compound to be pelleted. Preforms are discharged into tote boxes which are transferred by truck to the adjacent molding department.

Hand Molds for Short Runs

In molding various products, the methods employed are quite conventional so far as they apply to the thermo-setting phenolic and urea materials. Presses of all sizes up to 500-ton capacity are used. Whenever the quantity of moldings ordered is such as to warrant the use of multiple-cavity molds of large size, these are run in automatic presses, but hand molds in small presses are used on much short-run work and on complex pieces where there may be numerous inserts or loose pieces to handle so that the molding cycle is necessarily long in any event.

All conventional molding presses are operated from two common hydraulic circuits in which pressures of 2,500 lb. per sq.in. and 500 lb. per sq.in. are carried. These circuits are fed from oversize pumps operating from the same steam lines which feed steam for heating the presses. An unusual feature of the hydraulic system is that no accumulators are employed. The pumps deliver direct to the high-pressure lines, and as the steam pressure is constantly on the steam cylinders, there is always pressure against the water in the system; when water is drawn into a press, the pump follows up instantly to keep the system filled and under pressure. Duplicate units of both boilers and pumps are provided so that no delays need occur to shut down the plant even though some unit of the system has to shut down for service repairs.

Aside from the more or less conventional types of molding by the usual compression presses operating from the main hydraulic system, some work has recently been undertaken on a comparatively new form of injection molding press. These units are suited only for using thermoplastic materials, such as cellulose acetate, which remain viscous so long as heat is applied and solidify when cooled in the mold into which they are forced in plastic form under heavy pres-

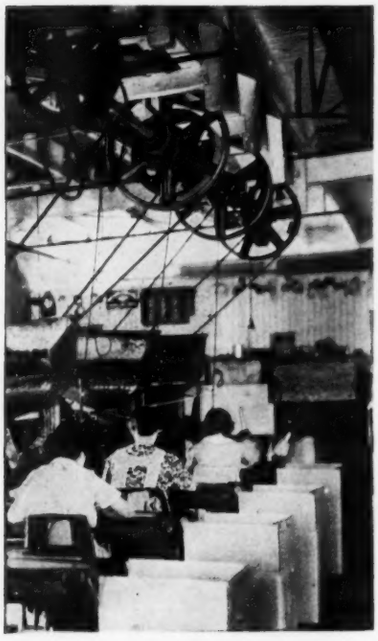


Above **— A general view of the molding department shows the pipe connections needed and the method of handling small parts in collapsible tote boxes**

Below **— In the cleaning department the tumbling barrels appear on the right with the inspection machines in the background**

sure. This, of course, is quite a different process from that in which powdered or preformed thermosetting materials are placed in the mold as powders or tablets, are there fluxed under heat and pressure, and then cured and rendered permanently solid and infusible by heat. The latter process is used for Bakelite, Durez, Resinox, Plaskon, Beetle and similar thermosetting materials, whereas injection molding is done with such materials as Lumarith, Masuron, Plastacele and Tenite, among others. Injection molding is done in a process much like die casting and on machines similar in general construction, but the materials are heated in smaller quantities; as yet production is confined to parts weighing up to 1.25 to 1.5 oz. and usually rather small in projected area.

Two makes of injection molding machines are installed in the Boonton shop; both are self-contained units having their own power-operated mechanisms for opening and closing the molds and for forcing liquid material into the mold. Of these, one built by the Hydraulic Press Manufacturing Company is completely hydraulic except for heating and the electric motor for pump drive. The pump is a radial-piston variable-stroke type, and pressure is used first to close the mold and then to actuate a plunger which forces liquid plastic into the mold. Plastic is heated while in a cylinder jacketed with oil warmed to about 390 F. or in a cylinder heated direct by electric means, or both, being fed into one cylinder from a hopper. One of the cylinders acts as a preheating device and discharges into the second cylinders which is electrically heated and contains the ram for injection into the mold.



Small parts fed into the hoppers are carried past the inspectors on an endless belt, turned over automatically and if passed are fed into cartons for shipment

Electric Injection Molding

In the second machine, known as the Isoma and manufactured in Germany, the cycle is generally the same except that no preheating is needed. This machine, however, is completely mechanical (as distinct from hydraulic) but is driven by electric motors; the functioning of its parts is controlled automatically by electric timing devices built into the machine. Heating of the material is done directly by electric means.

In both machines, the rate of molding is rapid and varies as a rule from about two to eight or ten "shots" a minute. In general, the mold has several cavities for small parts, and the production rate is, of course, equal to the number of shots times the number of cavities filled per shot. Time enough must be allowed for the plastic to solidify and cool so as to retain its shape before the mold can be opened and the pieces are ejected. As the plastic is fed through a sprue hole and distributed to the respective cavities by gates, each piece is produced with a sprue or gate attached and this must be broken or trimmed off, much as in die castings. There may be a slight flash at the mold parting, but if the halves of the mold make a tight fit no flash appears. Small parts having sections as thin as 0.020 in. can be molded, and if desired, each cavity in the mold can be different. Sprues and gates can be remelted and hence do not constitute waste. An accompanying illustration shows some of the moldings produced to date on these machines.

Moldings made from cellulose acetate can be transparent, translucent or opaque and of any color desired; mottled or striated effects can be produced by mixing granules or powders of different colors when the molding compound is put into the machine. Metal inserts can be used, if required, as in compression molding, but the cycle is lengthened by a time equal to that for putting the inserts into position. Rapid production is possible, even with molds having few cavities, and molds, being of small size, are usually moderate in cost. Acetate materials cost the molder from a low of 30 cents a pound for black through 60 cents for colors to much higher figures for pearlescents. These prices are multiplied by two or three in the finished molding to allow for fabricating and other costs. Materials used are light in weight, however, hence many pieces are generally produced for each pound of material used.

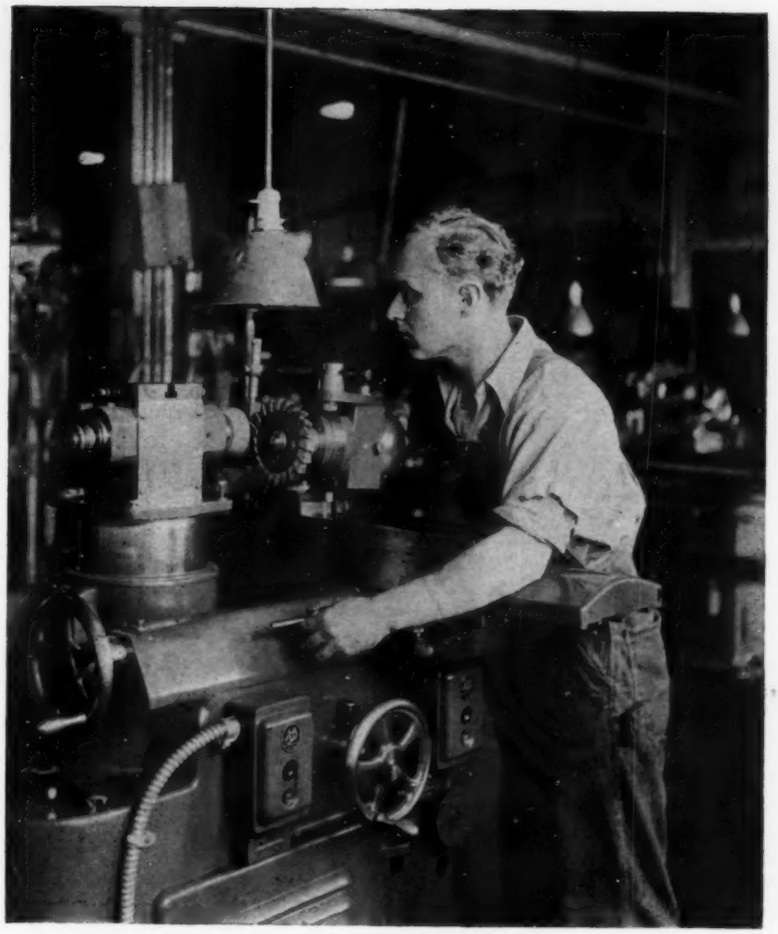
As moldings are taken from the presses in the molding department, they are placed in wooden tote boxes and are transferred by hand, when the boxes are filled, to an escalator conveyor which carries them to the second floor for cleaning and inspection prior to shipment. So far as possible, each lot of moldings travels through a fixed circuit of operations and is delivered to the packing department with a minimum of handling; with a large variety of work going through the shop, the circuit necessarily varies to some extent, depending upon the particular operations required.

Conveyorized Inspection

Small parts are cleaned of fins by tumbling and are subsequently given a high polish by a second tumbling with shoe pegs and a suitable polishing compound. Each part is then inspected, and this process is facilitated by special machines such as are used in the button industry to insure rapid visual inspection of both sides. In these machines, pieces are placed in a hopper and are fed onto a belt which moves slowly past the inspector. The piece is then turned over automatically and passes a second inspector who views the other side as the same belt carries it forward. Defective parts are thrown out, and the perfect ones are fed into cartons which are sealed and shipped to the customer.

Where quantities are small or pieces are large, hand or machine cleaning on special double edging machines with conventional tools is usually employed. Some kick presses are used to shear off fins or gates, when this is economical, but much hand cleaning with files and scrapers is done, as in other shops, when machine cleaning is not feasible or represents no saving.

Tote boxes in which moldings are delivered to the cleaning department have hinged bottoms and sides so arranged that the entire box folds flat when empty and is handled with corresponding economy of space when being stored pending return to the molding department.



Seattle's

Trade Training

H. G. HALSTEAD
Instructor, Machine Department, Edison Vocational School

AT A conference held in January, 1934 by the Seattle School officials, the Federal and State Boards of Vocational Education, and local industries, a department of training for machinist apprentices in the Edison Vocational School was established. This school is a unit of the Seattle Public School system and is partially supported by funds provided for by the Smith-Hughes Law for fostering trade school training.

As a result of this conference, the first machinist trade course to operate in Seattle was started in September, 1934. It had the endorsement of local machine shop owners and their superintendents as well as the school officials. This course has been carefully planned to duplicate as far as possible the conditions apprentices would find in a well-equipped machine shop.

In addition to actual machine shop practice, students must use two hours of the daily six on related work consisting of applied mathematics, drawing, physics, chemistry, mechanics and metallography as well as heat treatment of iron and steel. Students who are high school graduates and who have made successful grades in mechanical drawing, chemistry, physics, algebra, geometry and trigonometry are considered desirable for admission to this course. While these are not absolute requirements they do receive major consideration at the time of application. After two months of probation, if the student is successful in passing a prescribed test, he is notified that he is eligible to go through the entire course and is given instruction in actual machine tool practice. Students who have completed this two year course are allowed this time on apprenticeship courses in most of the local machine shops and factories.

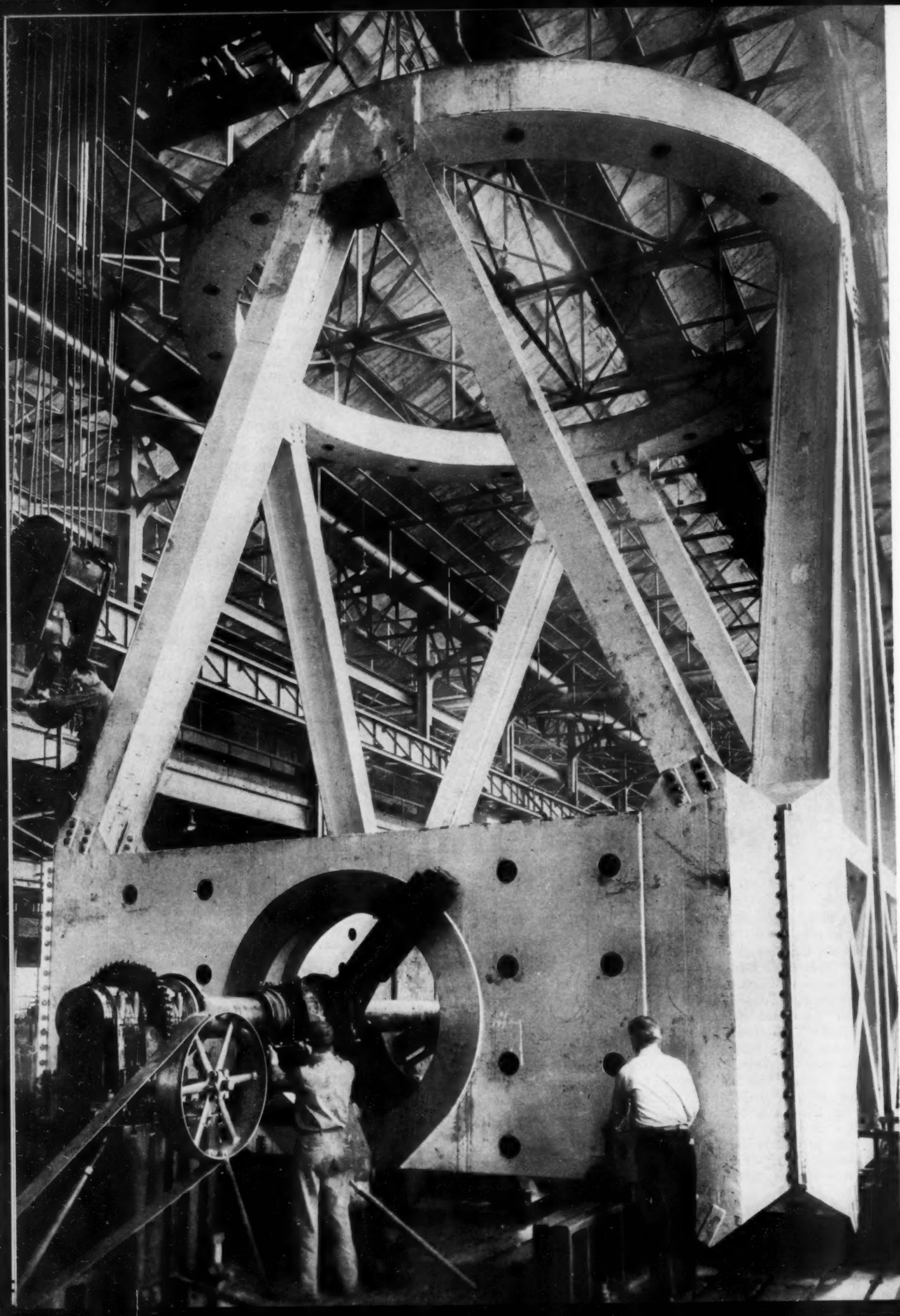
Four Hours School Per Week

Another program was organized through the activities of the Advisory Committee and operates under the Washington State Plan for apprentice training. The purpose of this plan is to provide adequate training and education for those who are already apprenticed. There are more than forty machinist apprentices from the various shops coming to the Edison Vocational School each week for four hours training in technical subjects related to the trade. Necessary funds are derived from local taxation and from State and Federal Agencies organized for this purpose.

The establishment and maintenance of this program are the result of the efforts of the members of the Seattle School Board; the State Board for Vocational Education; J. W. Kelly, State Supervisor of Trade and Industrial Education; Worth McClure, Superintendent of Seattle Schools; C. R. Frazier, Principal of the Edison Vocational School; J. J. White, Industrial Coordinator; and H. G. Halstead, Machinist Trade Instructor.

A third training course is in operation in the evening. This is a trade extension program and is open to apprentices, machinists and specialists in the local machine shops who are trying to improve themselves. There are five classes each week, and they run from 6 to 10 P.M. The course starts in September and runs for six months. There has been a waiting list of applicants since its beginning.

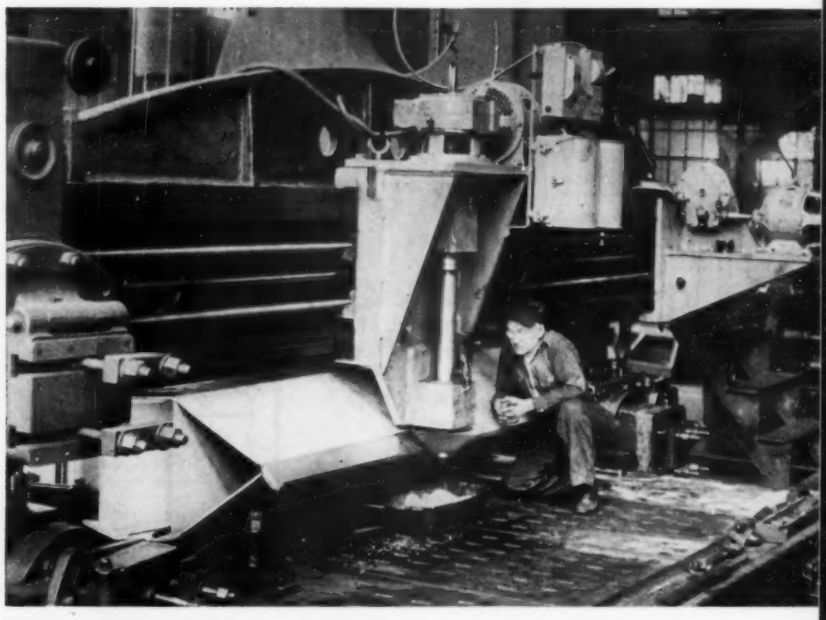
Courses are designed particularly for the student whose time is limited, and are decidedly practical. Shop mathematics, metallurgy and heat treating are taught. Material and parts for work are supplied by several local plants.



Welding

to Bring the Stars Closer

Completion of the 200-in. reflecting telescope for the California Institute of Technology reflects ten years of painstaking preparation and credit to Westinghouse's South Philadelphia Works which performed the frame fabrication

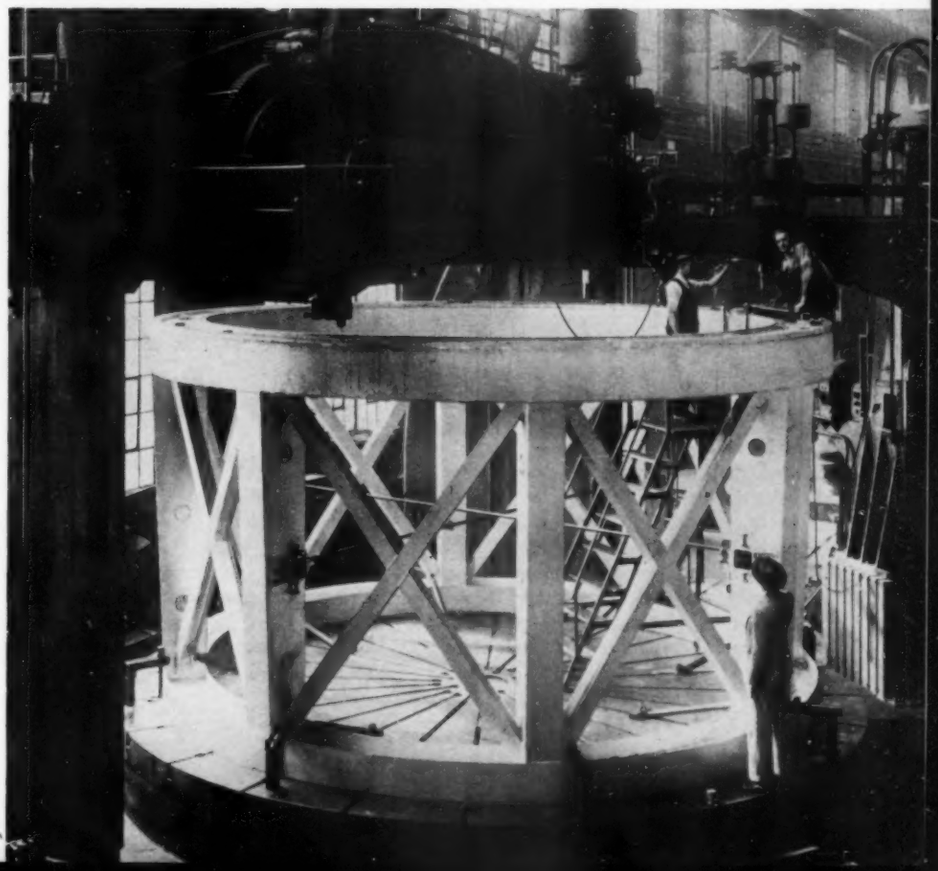


Left—*Gimbal bearing bores are machined with a 10-inch portable bar having screw feed and a driving length of 26 ft. Hook gages to align the top ring with the bar*

Above—*Welding the reinforcing members in one of the horn sections is a preliminary step in fabricating the 46-ft. "horse shoe" yoke. Outer plates are 4 in. thick*

Above right—*"Elastic hinges," which give a degree of flexibility to the panel connections, are machined by a milling attachment on a 14-ft. planer. Separate motors, operating through worm gear reducers, supply both cutter drive and feed*

Right—*With the prime focus cage still in the boring mill, bolt holes and holes to match the guide studs are drilled. Accurate indexing is secured by a fixed pointer against a steel tape on a 25 in. pulley keyed to the machine drive shaft. A reading of 1/16 in. on the tape corresponds to 0.0002-in. on the pitch circle*



Work Clamps and Supports

for Drilling Jigs

IX — Good tool performance, including accuracy and speed, depends on selection of the proper holding device

C. W. HINMAN

THE FIRST STEP in designing a jig is to lay out a plan of the piece to be drilled. Draw full size if possible, or half size if a full-sized scale is too large. From the plan, project all the side elevations of the piece in which drilling occurs, or where work fastenings are necessary. Sufficient space should be allowed between the views for drawing the jig walls and feet, and for adding subsequent dimensions.

Then select the proper type of jig design. Investigate whether the gaging points must be at particular points on the piece because of its function in use, or because of its relation to another member in its final assembly. Lay in the holes and all the necessary bushings in all the views. Build the walls around the bushings. Add a leaf if one is needed, and necessary fastenings. Provide body feet, or relieved supporting ribs on the sides opposite the bushings. Ribs or feet on the side opposite the leaf are usually necessary for supporting the tool when loading and unloading. The completed tool will be a composite of the designer's ideas objectified.

It is not good practice to detail tool parts on the assembly sheet, even though there may be room for them. Important center distances, and the dimensions for locating the final assemblies of major parts are usually shown. Rotational numbers should be given the tool parts, and each number inclosed in small circles, with an individual arrow touching the part.

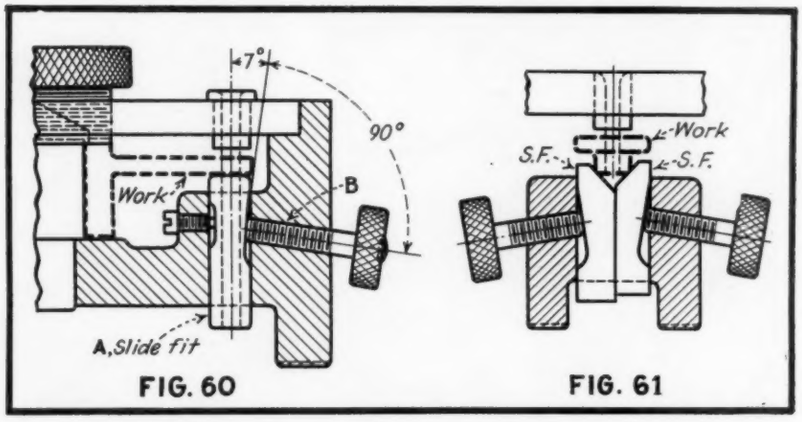


Fig. 60—A frail projection is supported for drilling by a touch pin *A*

Fig. 61—For a very frail projection it is better to use two touch pins which have been flatted together. Each will independently support an edge of a twisted piece

The material list usually appears on the assembly sheet. In addition to the bushing sizes, the only necessary dimensions on the assembly are those that locate the registering or gaging points for the work, and from these points to the center of each bushing. The body, leaf and special attachments are detailed and numbered on separate sheets.

"Stepped Dimensions"

Bushing holes are drilled and bored on a jig boring machine in most shops, and for this reason "stepped dimensions" for the location of bushing centers must be given (*AM*—Vol. 81,page167). There are several methods for giving jig boring dimensions, namely: degrees in arcs for circular work, from both sides of the vertical and horizontal center lines, from the left end of the work toward the right, and from the top of a horizontal work setting, downward.

The difficulties in choosing and applying correct principles for the design of work clamps and supports are many. It is upon this one successfully applied principle, moreover, that good tool performance, including accuracy and speed, depends most. It is because the sizes and shapes of work pieces vary greatly that an efficient holding device for one may be a failure in another.

We know that the drilling pressures for a single drill vary from 80 lb. for a $\frac{1}{16}$-in. diameter drill in cast iron, to 450 lb. for a 1-in. diameter drill in

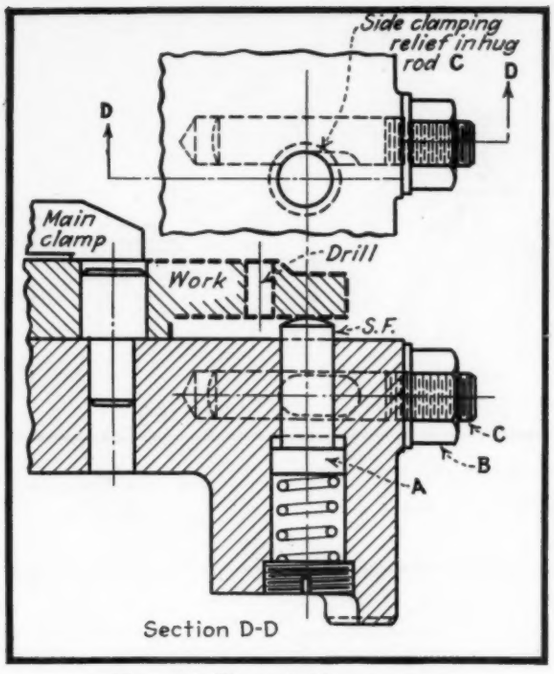


Fig. 62—More rigid parts can be supported by a "pop pin"

the same material. Clamps and supports must therefore be rigid and in close opposition to the bending moments of the cuts. To meet these stubborn conditions, the following principles for solving some of the problems which will arise in clamping and supporting the work are presented.

Only Four Principles

Only four fundamental mechanical principles appear in jig and fixture fasteners: the cam, the screw, the bolt hook or latch hook, and the wedge or key. All others are variations or combinations of these four principles. These principles can be mechanically applied in only two ways: first, directly against the work; second, to operate by using plates, pins, loose washers or equalizers, between the work and fastener. In all cases the operating position of fasteners should be within convenient reach. Care should be exercised in locating them safely in regard to revolving drills and cutters; this precaution may prevent serious accidents while locking or releasing fastenings.

The "touch pin principle," Fig. 60, is a design for supporting a frail projection on cast work after the cast body piece has been previously registered and clamped in the tool. The operator advances pin *A* with his fingers to an easy contact under the frail projection, and locks it there with screw *B*. The projection is then safely drilled without distortion, even though its location may vary considerably in different pieces. Observe that screw *B* contacts *A* at 90 deg. to its angular flat. This prevents the screw from being loosened by machine vibrations during the operation.

If the cross-section of a frail projection is very light, then two "touch pins" are flatted together, and each carries one supporting angle, as shown in Fig. 61. In using this method, the projection can vary considerably in its position, and even be twisted, or waved, and yet be securely held. Touch pins have a decided advantage in the support of frail pieces in contrast with spring pins or screws, either of which could easily distort the work and thus cause erroneous drilling.

Devices for Heavy Clamping

In very large tools for fabricating heavy parts, the clamps, plungers, jaws, and equalizers are operated by pistons, cylinders and compressed air. By using a special design of levers with a three or five to one compound of piston head power, very rigid and dependable clamping is secured. Magnetic chucks have also been used in holding ferrous work for machine operations, especially for milling.

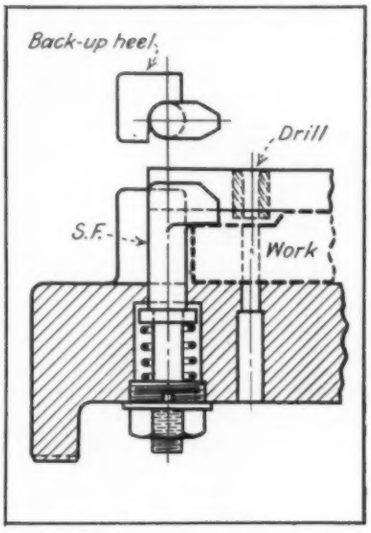
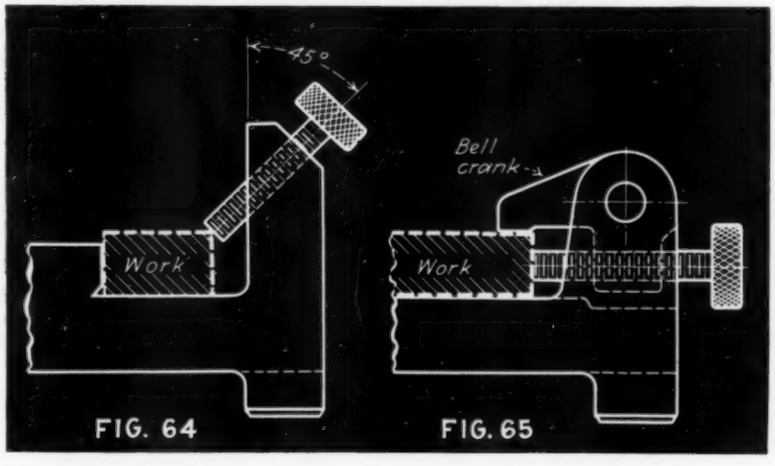


Fig. 63—A back-up heel will prevent deflection of a hook bolt under severe clamping

Figs. 64 and 65—Two methods of clamping in two directions are shown. The "bell crank" is a better design because the clamp and screw points can be put farther apart for better clamping effect



Both methods have a common advantage in large work in that both are quick to clamp and release the piece.

Two views of a spring-pin locking support, sometimes called a "pop pin," are given in Fig. 62. This familiar design provides a positively locked support for drilling or milling extension arms on the work piece. Spring pin *A* is depressed by the work when the piece is placed in the tool. After the main clamp is tightened, spring pin *A*, while still in contact with the work, is locked in that position by tightening nut *B* on "hug rod" *C*. This design is similar in purpose to the "touch pin," but is intended to support more rigid parts, or the body of the work, which are

not subject to spring-pin distortion. A pop pin is very useful in its proper place. The compression spring eliminates hand setting the pin. This device distorts frail pieces and causes inaccurate work, whereas a touch pin does not. Some prefer designing this support with hug rod *C* as an eye bolt, instead of with a side-clamping relief, and with pin *A* passing through the eye. This design may prevent buckling the hug rod if the nut is over-tightened, but it fails to hold as securely as the design shown.

Fig. 63 shows one of several designs for operating a hook bolt. If the bolt is heavy, as used in large tools, the position shown is reversed. Gravity or a light tap on the bolt frees the hook and work when loosening the nut. In this case the compression spring is obviously unnecessary. Observe the backing heel behind the bolt to prevent its deflection under severe clamping, and to check its turning with the nut.

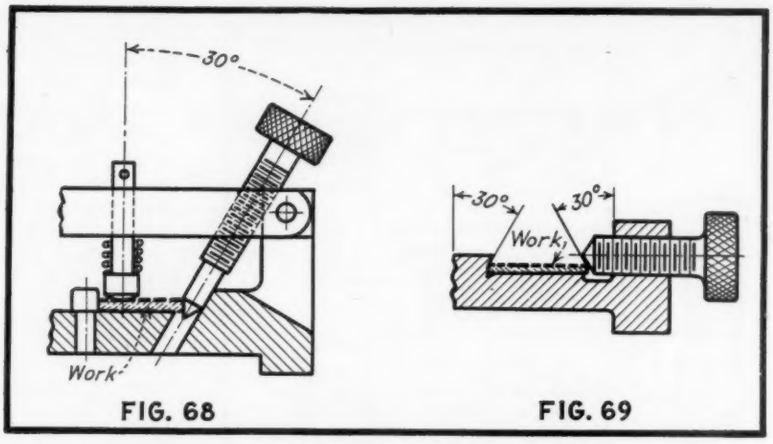


Fig. 68—A conical-pointed screw moves a thin piece to gage.

Fig. 69—A similar screw holds a thin shelf in two directions

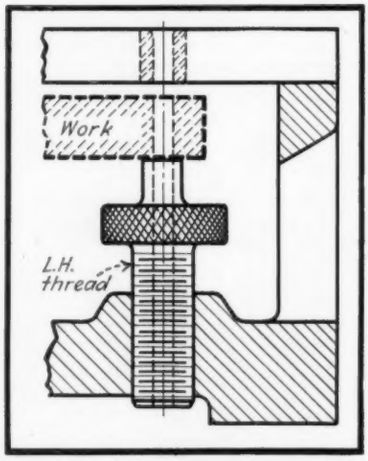


Fig. 66—Screw jacks must be within convenient reach of the operator, and are not used against a frail piece likely to distort

In Fig. 64 an angular positioned screw holds the work in two directions. The angle can vary to suit individual cases. It is necessary to attach an auxiliary clamp when using angular screws of this character.

In Fig. 65 is the well known "bell-crank" principle as illustrated as applied for holding variable work in two directions simultaneously. This is a better design than shown in Fig. 64, because the clamp and screw points can be stationed far apart for better clamping.

Fig. 66 is a sketch of the common screw jack support. These screws must be within convenient reach of the operator. The main fastening must be secured before the screw is advanced. Screw jacks are most often used in milling fixtures, and sometimes in large drilling jigs for irregularly shaped work, but never against a frail piece which might be distorted by the screw pressure. The threads are cut left handed, and the screw is advanced by right-hand turning.

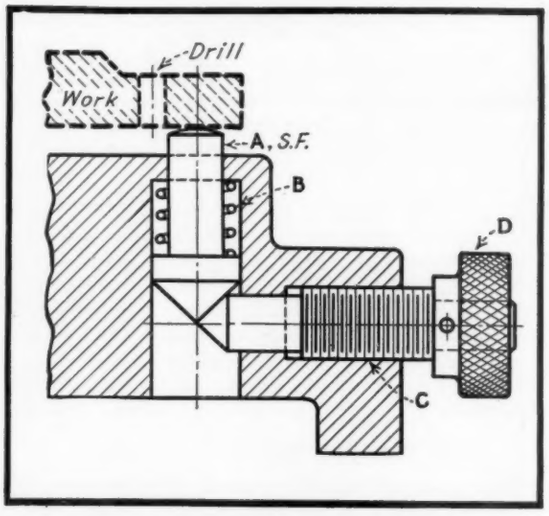


Fig. 67—An inaccessible point on the work can be reached by this support which consists of the conical-pointed screw moving the conical-ended pin

An inaccessible point to reach by any other support is easily accomplished as sketched in Fig. 67. Pin *A* is elevated against compression spring *B*, and contacts the work at the point desired. This is accomplished by the sliding action between the conical ends of *A* and *C*, which raises or lowers *A* when screw *C* is moved forward or back. This principle has two advantages: Screw head *D* is outside the tool and within easy reach without interference, while screw rod *C* can be any reasonable length for reaching otherwise difficult points of work support far within the tool.

A conical-pointed screw also has many direct applications on the work. The principle is shown in Fig. 68 where very thin work is moved to gage. There are cases where a peculiarly shaped shelf, or lip, on the work must be supported, and where nothing else seems to suit so well as this type of screw. With an obtuse angled cone, and the screw set to the work as in Fig. 69, a thin piece is held in two directions.

The next article continues the subject of work holding devices used in jigs and fixtures.

Part X of Mr. Hinman's series on tool design will appear in an early number.

Double Draw

HIGH-SPEED steel tools, quenched at 2380 F., given a double draw at 1050 F., and cooled below 350 F. between draws, give longer life according to A. H. d'Arcambal, of the Pratt & Whitney Company. If not allowed to cool down to the lower temperature, the high-speed steel will not acquire its full hardness.

Ideas from Practical Men

Drill Jig With Sliding Bushing Plate

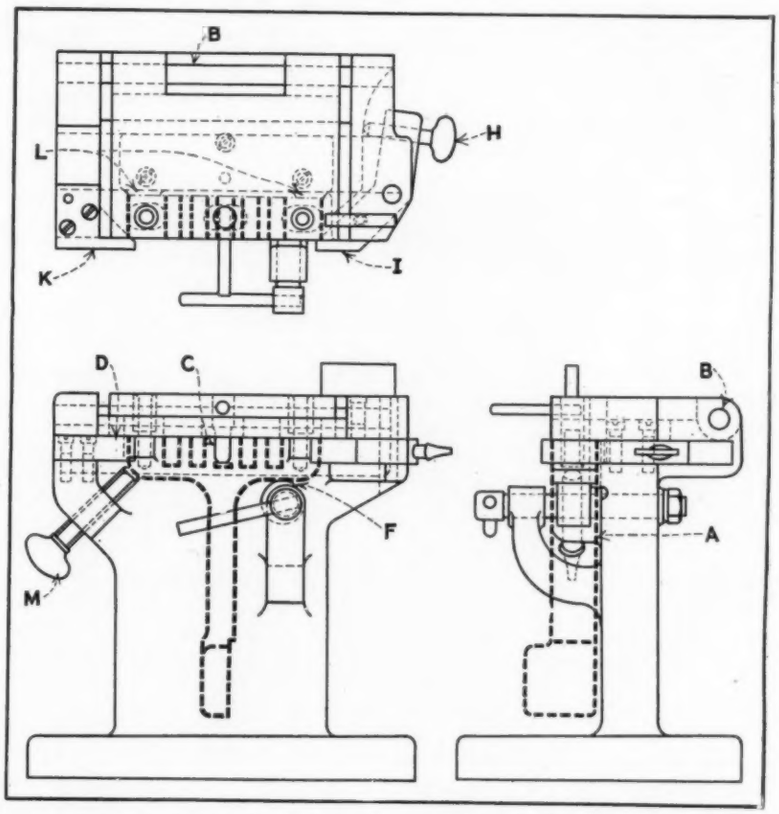
PHIL. E. VERAA

In the illustration is shown a drill jig designed for drilling two holes, each equidistant from the center slot in the work indicated by heavy dotted lines.

The top face and the slots were machined square with the surface *A*, which had been previously machined by grinding. As the work is clamped from below and is centered from rough faces, the bushing plate is made to slide on the shaft *B* to which it is hinged, to permit the flatted pin *C* to engage the center slot in the work, regardless of variations in the position of the slots.

In operation, the work is held against the banking plate *D* and the bushing plate is brought down, pin *C* entering the center slot and locating the plate so that the bushings are equidistant from the center slot. Eccentric *F* is operated to hold the work lightly against the banking plate and the thumbscrew *H* of the pivoted clamp *I* is screwed in, forcing the work against the inclined surface of the stationary wedge *K* and squaring it against the pads *L*. The eccentric *F* and the thumbscrew *M* are then tightened and the bushing plate is locked by a quarter-turn screw, not shown.

Slotted clearance holes are provided in the banking plate for the drill bushings and the locating pin to permit them to slide with the bushing plate without interference.



Since the holes must be equidistant from the center slot, the bushing plate is made to slide, its position being controlled by a pin engaging the center slot

Freak Magnetic Action

H. R. HAGEMAN

A die-block 1 in. thick had a ¾-in. hole counterbored ⅜ in. deep in which was a sliding shedder bushing. The travel of the bushing in the hole was limited by a collar on its end contacting the bottom of the counterbore. Both parts were hardened.

Desiring to grind the die-block and the bushing to the same height, the diemaker assembled them and placed them on the magnetic chuck in the surface grinder, the counterbore being next to the chuck. When the current was turned on the bushing rose above the die-block to its limit. When pressed down it would rise again as though on a spring.

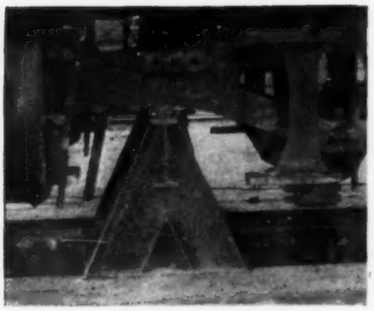
The shop electricians advanced various theories in explanation of the phenomenon, but none of them were satisfactory. However, the diemaker was glad that he noticed the action before passing the work under the grinding wheel.

Can any of the readers explain why the bushing should have popped up instead of being held down by the magnetic flow?

Welded Locomotive Support

FRANK C. HUDSON

A good example of the growing use of welding in railroad shops is that of the steel "horse" or frame support for locomotives, as shown. Both the legs and the top, or cross member, are made of I-beams, while across the bottom is a flat bar, to make good contact with the rails. By using an angle, with one leg down on the in-



This stand is used to support the locomotive by the front of the frame when the wheels are removed during an overhaul

side, it could be made self-locating on the tracks. The way in which the cross beam is fitted into the legs shows good laying out and cutting before the welding was done.

Old Mike Becomes a Lathe Stop

OTTO A. WAGNER

Referring to the article under the above title by H. M. Nantais (*AM*—Vol. 81, page 173), no doubt the device described will work well, but the need of a lathe stop is likely to assert itself when no old mike is at hand. Then, too, often there is hardly time to make such an elaborate affair. Yet a lathe stop of a sort can be made from a C-clamp of suitable dimensions, such as the Starrett No. 72, and a piece of ½-in. square cold-rolled steel. One end of the steel should be squared and then slightly crowned to present a small contact surface to the carriage. It should be clamped to the ways in such a position as to form a stop against which the carriage wing will make contact.

In adjusting the stop, place the thickest blade of a thickness gage between the stop and the carriage wing. Then by substituting thinner blades the carriage can be advanced by increments of 0.001 in. at a time. Gage blocks or an inside mike could also be used. If something more elaborate is desired, a clamp made as suggested by Mr. Nantais can be made, substituting for the mike a screw having 20 threads per in. and provided with a locking device of some sort.

If an inside mike is at hand, instead of the screw in the clamp, a hole of the right size to take the mike rod can be drilled in the clamp and a clamping screw can be provided to lock it. The device can then be used in the same way as that described by Mr. Nantais.

Drilled Screw Used For Spotting

FRANCIS W. SHAW
Broadley, Lancashire, England

Referring to the article under the above title by James W. Emmons (*AM*—Vol. 80, page 1087), to insert into the part a screw having a drilled hole to guide a spotting drill does not entirely overcome the difficulty, for the final drill may easily run out of position if guided by the spot alone. Further, it is necessary to slide the part along the shaft to enable the final drill to be applied to the spot.

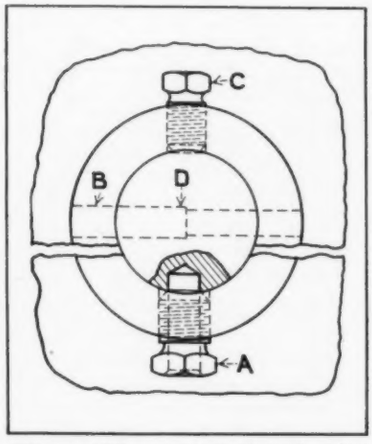
A preferable method, in extensive use in Great Britain, is illustrated in the sketch at *A*. A hardened and threaded bushing having a hole of the same diameter as that of the dog point on the setscrew is used as a guide for the drill. Where the dog point is taper, as it is in improved practice, the end of the drill would be tapered and the lands well relieved to act as a reamer.

An alternative method is shown, but it is not so good, as it entails removal of the part for tapping and assembling. A hole at *B*, of the tap size for the setscrew, is drilled in the part and is used to guide the drill for drilling the hole to receive the screw point, the part being meantime secured by the temporary setscrew *C*.

Where a setscrew or a drill bushing bears on a shaft, the shaft should be slightly flatted. Setscrew bruises will not then mar the part upon removal.

If the part is to be secured by a taper pin, the hole *D* is drilled about half way through the shaft and is continued by a smaller drill, leaving a stepped hole which is afterward reamed by a taper-pin reamer.

Incidentally, I have found nothing to beat a flat reamer for rough taper reaming a stepped hole. It is naturally a little shaky and is likely to leave chatter marks, but they are of no consequence if the hole is to be finish reamed afterward.

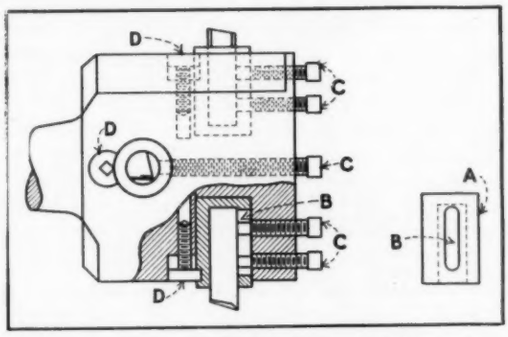


When drilling a hole for the dog point of a setscrew, use a hardened bushing screwed into the part to assure accurate location

Cutter Head for Boring and Counterboring

R. G. HEWITT
Huddersfield, Yorkshire, England

The greatest snag to the cutter head described by Charles C. Tomney in an article under the above title (*AM*—Vol. 80, page 1088) is the possibility that the setscrews *F* will loosen, thus allowing the nuts *B* to unscrew over the cutting edges of the tools with disastrous results.



The cutters are held tightly in bushings by setscrews. Adjustment is by hollow-headed screws, the heads of which engage cross slots in the bushings

In the alternate design illustrated this objection has been overcome by a more positive method of adjustment and a better method of locking the cutters. The cutters are located in steel bushings, one of which is shown at *A*. The bushings are slotted at *B* to enable setscrews *C* to lock both them and the cutters securely in position. The inner ends of the cutters contact the bottoms of blind holes in the bushings, and the heads of the hollow-headed adjusting screws *D* engage cross slots in the bushings and permit a wide range of adjustment to the cutters.

When adjusting the cutters, the setscrews *C* are eased off enough to permit movement of the bushings and when they are tightened the cutters are locked in the bushings and the bushings are securely locked against

the walls of the holes in the cutter head, so that any possibility of the adjusting screws moving is eliminated.

Punches and Dies for Cutting Templets

L. S. TAYLOR
Dept. Foreman, L. & N. R. R., Louiville Shops

In machining some locomotive forgings, one of the first and most important requisites is to make sheet-metal templets. Where a metal bandsaw is available, the templets can be sawed out and then finished to the lines by filing. But it frequently happens that openings and slots have to be cut that are inaccessible to the bandsaw and they are chiseled.

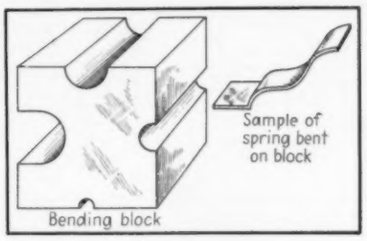
A much better method is to make the cuts by the use of a small die-block having round and rectangular openings, and two punches, one round and the other rectangular to fit the openings in the die-block, as shown in the illustration. The punches have throats at *A* for the entrance of the metal to be cut away. The round tools are used to cut fillets and irregular shapes and the rectangular ones are used for straight cuts.

The desired openings are first punched out roughly in a power punch. In using the tools described, the templet is blocked up on a surface plate slightly higher than the die-block, no clamping being necessary. The cutting edge *B* of the punch is brought to the line and a sharp blow from a hand hammer shears the metal.

Spring Bending Fixture

JAMES W. EMMONS

It was necessary to bend a large number of springs from clock spring steel, 3/32 in. thick by 1¼ in. wide as illustrated. Because this material is very hard, the manufacturing cost of the spring was high and the number



of pieces spoiled through breakage was also high. The simple tool shown proved of great assistance in bending springs, and very rarely was a piece broken. The section of the spring to be bent is placed over the correct groove in the block and then hammered lightly with a cross peen hammer until the required shape is attained.

Taper Dowels?

C. G. WILLIAMS

Referring to the article under the above title by H. R. Hageman (*AM*—Vol. 80, page 811), the trouble with taper dowels is that they cannot be made as tight nor kept as tight in both members as can straight dowels. At no time can two taper dowels be found of accurately the same size and taper. Mr. Hageman would probably say that the holes can be reamed to size, but how about the reamer? Can one find a reamer in any shop that is accurately of the same size and taper as any batch of dowels received?

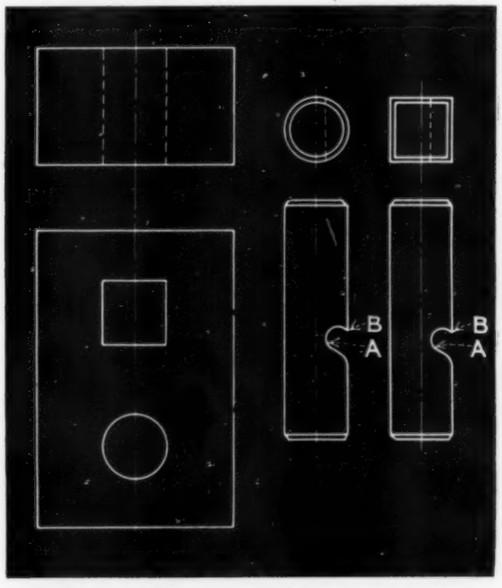
A would-be corrective as advanced by our shop was to make all the taper dowels on one machine with the same set-up and have them on hand for years, because we can never get reamers of the same size and taper as the dowels made in different batches.

Will all dowels made on one machine with the same set-up be alike? Will the tools used to make them wear the same in all cases and at the same points? Who can guarantee fits? Drivel? Oh yes! But dowels must often be fitted in holes in hardened parts. Can it be guaranteed that the holes in hardened parts will not be distorted? I have yet to see a taper dowel that will fit a reamed hole accurately and closely the entire distance, and if the dowel is driven into two soft members it cannot be gotten out. Just try it sometime.

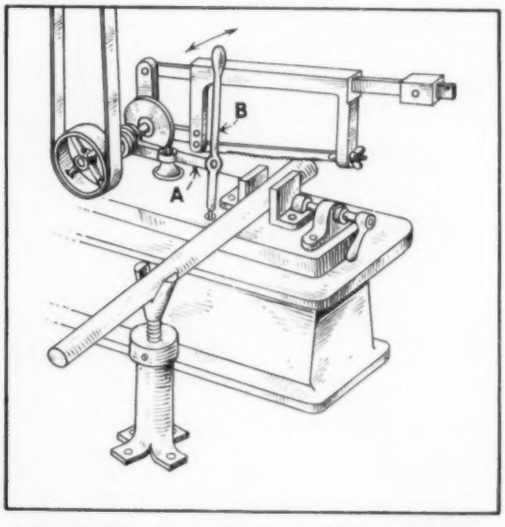
Articulated Clutch Lever for the Hacksaw

CHARLES H. WILLEY
Superintendent of Manufacturing Hoyt Electrical Instrument Works

The drive for the power hacksaw in our toolroom is clutch operated and the original clutch lever *A* was a short horizontal one, and was rather inconvenient to operate when the work was in place in the vise. By



The cutting edge of the punch is brought to the line, the surplus metal entering the throat. A sharp blow from a hammer shears the metal. Irregular and straight cuts can be made



Inconvenience in operating the driving clutch by the original horizontal lever was eliminated by the addition of a vertical lever attached to the original one by a yoke

the simple addition of the vertical lever *B* having a yoke connecting it with the original lever and having a ball tip at its lower end and fitting loosely in a hole in the machine bed, engaging and disengaging the clutch was made very easy and convenient.

Kinks Did It—Why?

GEORGE J. MURDOCK

In connection with my original article under the above title (*AM*—Vol. 80, page 893) and the alternate methods proposed by two contributors, permit me to submit a rejoinder.

From a mechanical standpoint, no fault can be found with the method proposed by Herbert M. Darling (page 1052), except that in my opinion the stuck arbor he mentions was so firmly seated that its outer part would have been twisted off, no matter how large a fillet had been left at the shoulder.

In the experience cited in my original article there was the usual nut for removing the arbor, and when it was tightened against the spindle nose, blows by a lead mallet on the end of the wrench failed to budge the arbor. Then the knee was raised to contact the wrench. With the back gears engaged, the result was that the threads were stripped from the 2-in. nut. The conclusion is therefore justifiable that if turning the 2-in. nut would not exert sufficient pull to remove the arbor, the small nut at the outer end of the arbor, proposed to be used by Mr. Darling, would have proved ineffectual.

It is seldom that an arbor cannot be removed by the nut provided for the purpose without damage to the machine, particularly if a thin tool-steel washer is placed behind the nut before the arbor is put in the spindle. It is the exceptional case only where something radical must be done, and it should always be as merciful to the machine as possible.

As to the method proposed by Robert S. Alexander (page 1088) in which the cross-feed screw was used to start the arbor, designers of milling machines have evidently not reached the point where they contemplate that the cross-feed screws and their thin bronze nuts might be used as stump pullers.

Fixture for Milling Oval Opening in Tubing

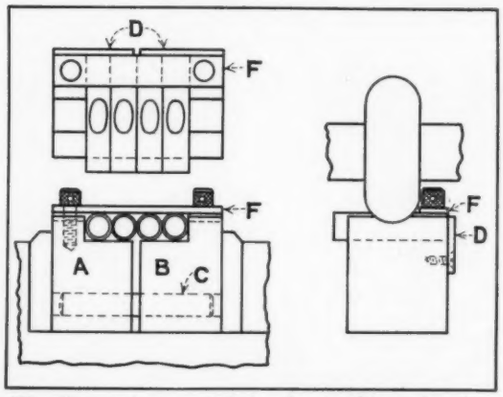
H. L. WHEELER

In the illustration is shown a fixture for holding four pieces of thin-walled brass tubing while oval openings are milled in them with a round-faced cutter, the oval shape being due to the rotundity of the work.

Since the shop where the work was done is a small one having limited and old-fashioned equipment, the fixture was "bench designed" and was made in a hurry. In use, it is held in the machine vise.

The two principal parts *A* and *B* are duplicates and are kept in alignment by the ⅜-in. dowel *C* which is a slip fit in reamed holes. Suitable stop plates *D* and the strap *F* for holding down the work are provided, the hold-down strap having elongated holes to permit the jaws to open when the vise is opened.

The outer ends of the workpieces project from the fixture to facilitate loading and unloading. Very little pressure from the vise screw is required to hold the work firmly enough to withstand the cut. The feed is about ¼ in. per revolution of the cutter and the production is at the rate of 128 pieces per hour.



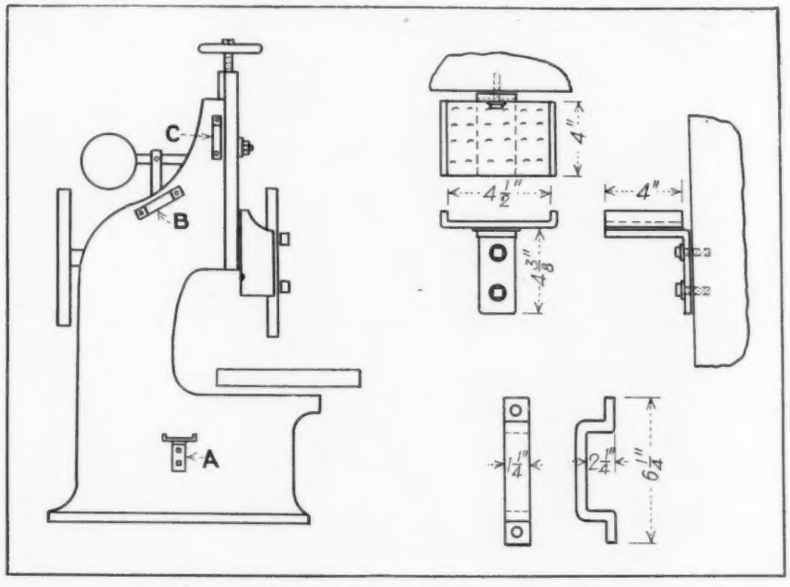
The fixture is mounted in the machine vise, its two parts being kept in alignment by a substantial dowel that is a slip fit in reamed holes

Slotter Provided With a Step and Two Hand Holds

FRANK BENTLEY

The handwheel for adjusting the stroke on slotters of the smaller type is generally at the top of the ram, making it necessary for the operator to climb on the table to make the adjustment. Benches or portable steps to aid the operator in climbing on the table are not often conveniently at hand because of the rigid safety rules that require the space about machines to be kept clear and unlittered. Yet such means are almost a necessity, as there is nothing on the slotter that affords either a foothold or a grip for the hands.

In the sketch is shown a slotter provided with a step at *A* and hands holds at *B* and *C* which make it safe and easy for the operator to climb on the table. Details of the step and the hand holds are shown at the right. They are easily made and applied. The tread of the step is roughened with a round-nose chisel to prevent slippage.



Aids to adjusting the stroke of a small slotter are convenient for the operator and make it safe for him to climb on the table

Overlays vs. Castings *of* Wear-Resistant Alloys

After giving us the nine factors involved in selecting a process for wear and corrosion resistance (*AM*—Vol. 81, page 365) Mr. Smith follows with the ramifications of whether to apply an overlay by welding-on, casting-on, spinning-in, or to use a solid casting

MILES C. SMITH
Colmonoy Company

PROPONENTS of protective *overlays* have not been satisfied to let matters rest with development of the welded-on variety. They have devised and perfected methods of casting-on and spinning-in. Consequently, the fabricator cannot stop with the simple decision to use an overlay. He must decide as well what type of overlay and which of the three processes of application will be best suited to his needs. Of course, the purpose of these overlay is to provide wear-resistance and corrosion-resistance, with possibly heat-resistance and resistance to oxidation. These materials have plenty of competition from merchant metals such as stainless steel and others which have been perfected to such a degree that at least one of them will probably meet the requirements of any specific application. Not all of these new alloys may be rolled or drawn, but all of them may be cast into at least simple shapes. But the principal factor in selecting any of these materials is the wear-resistance that can be expected of them.

Wear-Factor Evaluation

Recently a method of evaluating materials by means of a "wear-factor" has been developed by Dr. Clark and Dr. Freeman of the California Institute of Technology, and reported by the latter in *Metal Progress* for March, 1937, page 281. In this test a rotating ring is run in contact with a stationary shoe which is loaded. Petroleum distillate is employed for lubricant for some tests, although others have been run dry. The wear at any given load and speed depends upon the contact surface area and the length of surface passed over. Results of the tests are expressed by dividing the loss in weight of the specimen by the projected area of contact and the length of travel. The unit wear value is given in grams per square inch per foot and the term "wear factor" represents 10^8 times the loss in weight expressed in grams per square inch per square foot.

In light of this test consider a few present-day alloys. One has a wear factor in unlubricated metal-to-metal contact of 1.4. Another alloy, under the same conditions, has a wear factor of 0.5 and a coefficient of 0.01. To give an idea of what such figures mean, a patented molybdenum-nickel cast iron considered very abrasion-resistant gave a wear factor of 172,000 and a coefficient of friction of 0.20 under the same conditions. Furthermore, the alloy that had the 1.4 wear factor also has a compressive strength of 440,437 lb. per sq.in., and a tensile strength of 21,360 lb. per sq.in.

Corrosion resistance of available alloys is highly developed. Think of a weight loss of less than 0.05 per cent after exposure to one part sulphuric acid, four parts water for 100 hr. This particular alloy does not perform so well in nitric acid. In one part nitric acid and two parts water the weight loss is 4.22 per cent for 100 hr. of exposure. Another alloy, which is not particularly resistant to either sulphuric or hydrochloric acids, loses not more than 0.18 per cent of its weight during 100 hr. of exposure in a 1:2 nitric acid solution. Moreover, both of these alloys are very resistant to abrasion. It is evident that the designer of machinery and equipment need only set the standards for his requirements, and then look about for the alloy or alloys that will fulfill them.

Cost is the chief handicap to the more general adoption of solid castings for wear and corrosion resistance. The alloys that stand up and perform best in the most severe present-day service are relatively expensive to make, and are for the most part not readily machinable. Accurate dimensions must be obtained by grinding. Another stumbling block to the use of castings is their lack of desirable physical properties for a machine part. The majority of such metals have relatively low tensile strength, and some of them have low compressive strength as well. Aside from great resistance to wear and corrosion, they have little in their favor for an all-purpose metal.

Strength Not Important

Overlays, on the other hand, need not possess any great amount of strength, since they are no more than a protective coating and may depend upon the part which they cover for strength and other performance functions. The welding on, casting-on, or spinning-in of an overlay has little tendency to alter the physical properties of the metal overlaid.

Concrete examples will serve to show how a choice is made between a solid casting or some type of overlay. Pump parts offer an exceptionally good illustration.

In the construction of a centrifugal pump of the average type and design, one important unit subjected to both wear and corrosion is the

shaft sleeve. This part rotates with the shaft and, with the packing of the gland, forms a seal against the escape of the liquid pumped. Under these conditions the sleeve must not only withstand abrasion of the packing, but also corrosive action of the liquid passing through the pump.

Except in the case of very small pumps, or pumps that require little of their sleeves, solid castings of abrasion-resistant, corrosion-resistant alloys do not make satisfactory centrifugal-pump shaft sleeves. Welded-on overlays may be and are very often employed. Lately a new process has been found which is ideal for the fabrication of shaft sleeves for severe duty. It is the cast-on process of overlaying and is more economical to use than the welding-on method.

"Cast-On" Technique

So far as I know, there is only one metal that can be cast on successfully. It is a nickel-boride alloy which has such an affinity for steel that a bond corresponding to that formed by a welded-on overlay is obtained when the molten overlay metal is poured over a mild steel base. This particular metal may be ground to a high polish and wears smooth in service. Furthermore, it is all but impervious to the attack of sulphuric, hydrochloric or other acid or alkali solutions and is also wear-resistant. This type of fabrication offers an economical way to obtain wear and corrosion resistance and at the same time the strength and machinability provided by the base metal.

Not all centrifugal-pump parts are overlaid. Pumps which incorporate seal rings, thrust washers and the like can best be served by utilizing solid castings for the seal rings and washers. Such parts are relatively small, require only the simplest type of finishing and usually run free, or need have no great amount of strength.

Applications of "Cast-On"

Liquid end rods or plungers for reciprocating pumps offer another excellent application for the cast-on process. Like the shaft sleeves of the centrifugal pump, they are in constant contact with the packing forming the seal and are continually subjected to the corrosive action of the liquid pumped. Solid castings of special metal would be prohibitive in cost and could give no better service than a cast-on overlay to reinforce the rod or plunger.

In so far as cylinders are concerned, either for pumps or other equipment, the spinning-in process of overlaying cannot be surpassed. Although there are several spinning processes, the one with which I am most familiar is a patented procedure. It is giving a good account of itself for overlaying or lining tubes and cylinders. By this method the alloy is heated in the tube or cylinder until liquid and then the cylinder is spun until the alloy has solidified in place.

On the whole, this spinning-in process is only applicable where an even lining of constant thickness is required inside a mild steel tube or cylinder. Lengths of 10 ft. are being protected against abrasion and corrosion and there is scarcely any limit to the diameters that may be handled. It is also possible to obtain a lining or any desired thickness. For such applications solid castings would be prohibitive in cost and are unnecessary.

Every conceivable phase of the welding-on process for overlays has been written about and yet the same mistakes are made and the same misapplications are found constantly. Welding-on of an overlay is not just a branch of ordinary strength welding. It is a procedure that has a technique of its own. Unless this technique is practiced, there can be little hope of success. The parent metal must not be puddled in with and allowed to dilute the overlay metal, but sufficient bond must be had to insure that the overlay will stay in place. In other words, there must be some interalloying of the parent metal and the overlay metal at the place of contact.

Puddling and dilution of the overlay are difficult to prevent when the metallic arc welding process is used. The excessive heat of the electric arc, combined with inability to control the deposit absolutely, tend toward deep fusing, puddling, interalloying and dilution. With the oxyacetylene flame there can be no excuse for a poor overlay.

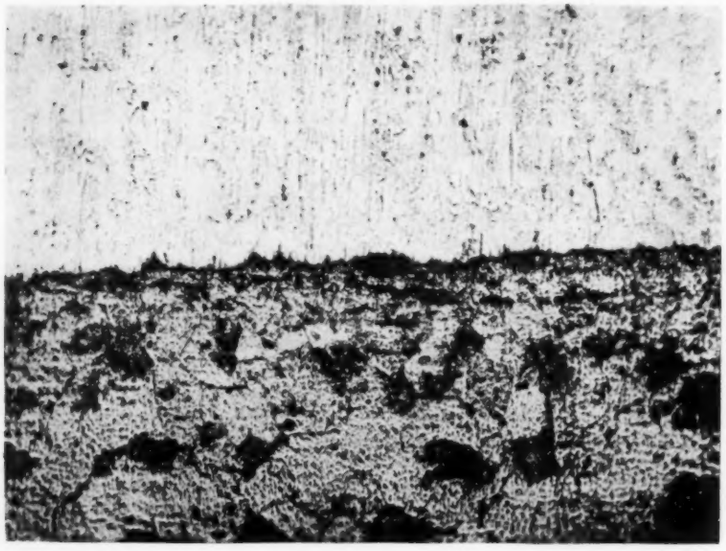
What an Overlay Is

A welded-on overlay at its best is nothing more than a casting formed from overheated liquid metal suddenly chilled. The crystalline structure is that of a suddenly cooled casting. If the overlay has any great amount of strength it will come from the physical characteristics induced by addition of chemical elements for that purpose. If relatively hard, it will be relatively brittle. Extreme hardness and extreme resistance to fracture do not go hand in hand, but rather have an inversely proportional relationship.

Since a welded-on overlay is a casting, some people may jump to the conclusion that there should be no physical or chemical differences between an overlay formed of a certain alloy and a solid casting of that alloy made by foundry practice. Theoretically, there shouldn't be, but most often there is. High temperatures, exposure to atmospheric influences and sudden chilling must be taken into consideration as well as dilution.

This knowledge is responsible for a relatively new procedure. Castings of an overlay alloy are made by foundry practice and brazed or welded to the part. This method insures that the overlay will have the chem-

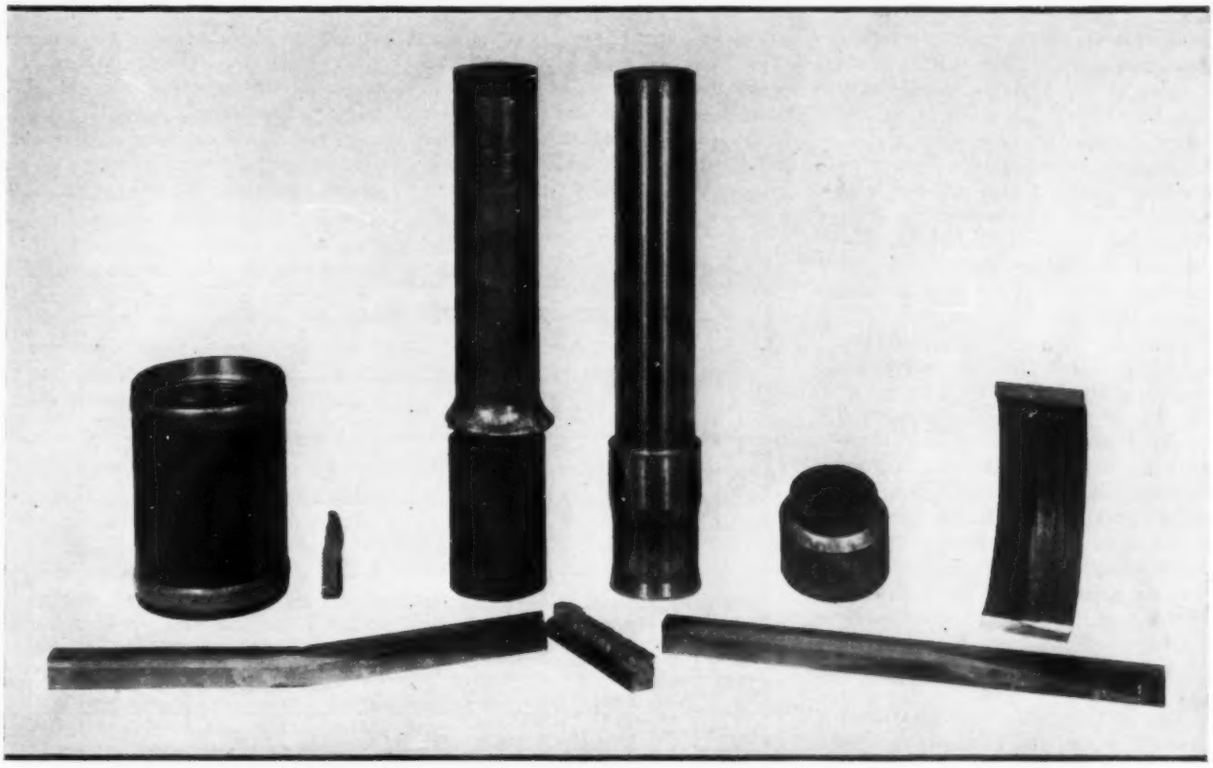
Bond between the cast-on overlay at the top and the base metal below. Magnification, 400 times



ical and physical properties desired, and yet it eliminates the necessity for using a large solid casting for the entire part.

One very pertinent example of this process is found in centerless-grinder work rests. The main body of these rests is formed of carbon steel, while working surfaces, or edges, are reinforced with a brazed-on solid casting of wear-resistant alloy.

For the same reason, it is sometimes desirable to change the design of a part originally intended to carry a welded-on overlay, and to use a small solid casting instead of the hard facing. The casting may or



A wear- and corrosion-resistant material has been overlaid on these parts by the cast-on process

may not be brazed to other parts of the assembly as the occasion demands.

During the early days of welded-on overlays or hard facings, no exacting limits were set. Such protective coatings were so much more efficient than the parent metals in use at the time that minor deficiencies were overlooked. Not so today. High standards have been set and there is no logical reason why they should not be maintained. To assist in this, alloy manufacturers who cater to the hard-facing industry have perfected their products to such a degree that the user has the very metal for any specific use at his instant command.

Another factor often overlooked, yet responsible for many failures, is the coefficient of thermal expansion. Wide variations in the coefficients of thermal expansion of the parent metal and the overlay metal can mean but one thing—failure. Unless wide divergence is eliminated, solid castings may be the only solution. A few overlay alloys possess the peculiar property of more or less adjusting their rate of expansion and contraction as they are heated up and cooled so that they may form an overlay without setting up dangerous stresses and strains or popping off altogether. Such alloys are rare. In the majority of instances any great difference in thermal expansion coefficients of parent metal and overlay spells trouble.

In the past, casting difficulties have been a stumbling block to the wider use of solid castings. Complex, delicate alloys are often very difficult to cast. If the part is of uneven section or irregular shape, shrinks and porosity will be so much in evidence that solid castings will be next to impossible. The one way to get around that difficulty is to split the part up into two or more simple castings, cast each separately, and then weld them together. The assembly will be sufficiently strong. If welded with the same alloy as the part, the assembly will have the same resistance to abrasion and corrosion at the weld as at the unit parts.

By using baked sand molds and cores and eliminating opportunities for shrinkage, it is possible successfully to cast the most delicate alloy metals. Gates and risers are of less importance than symmetry of form.

To sum up, the choice between a solid casting or various types of overlays resolves itself into a study of the chemical and physical properties of the metal which will best fulfill the requirements at hand. Then carefully estimate the expense involved in each type of processing. If the alloy cannot be successfully welded-on, cast-on, spun-on or spun-in when the desired parent metal is used, the choice is limited to either a cast part that can be brazed or welded in place, or to a solid casting regardless of cost. If all methods are possible, fabrication cost should be the determining factor. So far as service goes, the casting will not necessarily be more efficient nor have a greater length of life than an overlay, which may be applied in any desired thickness or to conform with any shape.

Flexible Specifications

A simple form permits listing parts for several similar units, saving clerical labor

GAYLORD G. THOMPSON

THE COMPILATION of engineering specifications for a line of similar products often involves tedious labor. This is especially true where changes are made frequently, or when new designs that affect only a small number of items on the specification are introduced. These revisions are often just enough to require rewriting an entire bill-of-material list. This practice, when carried on for any length of time, produces an accumulation of specifications that constitute duplications of so many units of standard parts that the lists, at first glance, look alike.

Take, for example, sub-assemblies or partly assembled units that are carried in stock for service orders or for future use in major assemblies. In almost every machinery plant there are single items that are used in more than one assembly combination. If there should happen to be four different units using a common item it would mean, under the usual method, that the item would be listed on each of the four different assembly specifications.

Combined List

The specification form illustrated shows how one list of items can be adapted to cover a number of assembled units. The items listed are an example of the component parts of four different backgear shaft assemblies. Each assembly is identified by its respective number, *200, *201, *202 and *203, which appears at the head of the column in which is enumerated the quantity of each item used.

In the event that a new backgear assembly is to be made up and it is given the number *204, the items would be enumerated in the column at the left of that headed *203 and any item or items not listed will be written in at the bottom. The column to the right of the vertical double-ruled line is reserved for listing quantities of items used in second sub-assemblies, such as shown by "Set Collar and Screw Assembly *322." This is shown here as an example of what can be done. Such sub-assemblies are usually carried on a separate sheet.

The number used to identify the specification sheet or list may be arbitrarily selected or can be the same as the number used to identify the first assembly listed. Standard specification lists are filed in numerical order with other specifications. If list *203 is called for, the information would be given *203 Spec. No. 200.

Paper on which this form is printed should be thin enough to permit blueprinting. Copies can then be reproduced for reference files in the sales, engineering, accounting and shop offices. Blueprinted copies can also be used as requisitions on stock and as assembly instructions.

STANDARD SPECIFICATION LIST

Name Back Gear Shaft Assemblies Number *200

*203	*202	*201	*200	Name of Part	Part Number	Pattern Number	Drawing Number
1			1	Back Gear Shaft 2" x 36"	73		73
		1		" " " 2" x 42"	78		78
	1			" " " 2" x 48"	80		80
			1	Back Gear 20" x 2"	76		76
1		1		" " 22" x 2"	77		77
	1			" " 24" x 2"	79		79
2	2	2	2	1/2" x 5/8" x 2" Key	81		81
1	1	1	1	5/8" x 2" Set Screw	--		
1	1	1	1	1/2" x 2" Set Screw	--		
			1	Pinion, 4" x 2"	90		90
1		1		" 6" x 2"	92		92
	1			" 8" x 2"	96		96
1	1	1	1	Throw-out handle	112	112-A	112
2	2	2	2	3/8" x 3/4" Flat Head M. Screws	--		
2	2	2	2	Set Collar and Screw Ass'y. *322.			
			1	3 1/8" x 1 1/4" x 2" bore, Set Collar.	117		117
			1	1/4" x 1 1/4" Headless Set Screw	--		
			1	Socket Wrench	26		26

Name Back Gear Shaft Assemblies Number *200

American Machinist REFERENCE BOOK SHEET ©

Metal-Polishing Grain Selection

METAL polishing is a loose term applied to the use of flexible, abrasive-coated wheels and belts where a quality surface is desired on metal, but size tolerance is not important. Polishing operations are commonly described as "roughing," "dry fining," "greasing," and "finishing," with the degree of finish dependent on the standard set-up by each plant.

Polishing wheels should be coated in a room free from drafts and held at a temperature of 80 F. to prevent rapid jelling of the glue, and the set-up should be completed quickly. Pressure used to roll the glued wheel in the grain trough is also very important in determining the polishing action. For example, when a 200-lb. man and a 130-lb. man set-up wheels, the wheels will give very different polishing performance. Packing of the abrasive grain on the wheel head is closer with increase in the downward rolling pressure while the per cent of glue decreases with increase in rolling pressure.

Tests have shown that it is advisable to preheat the abrasive grain and the cloth wheels to a temperature between 100 and 120 F. This will prevent the glue from jelling too rapidly during set-up. Under these conditions the glue solution can generally be applied at 140 F. On the other hand, when the abrasive grain and wheels are cold or only at normal room temperatures, rapid jelling of the glue can be retarded by heating it to 160 F.

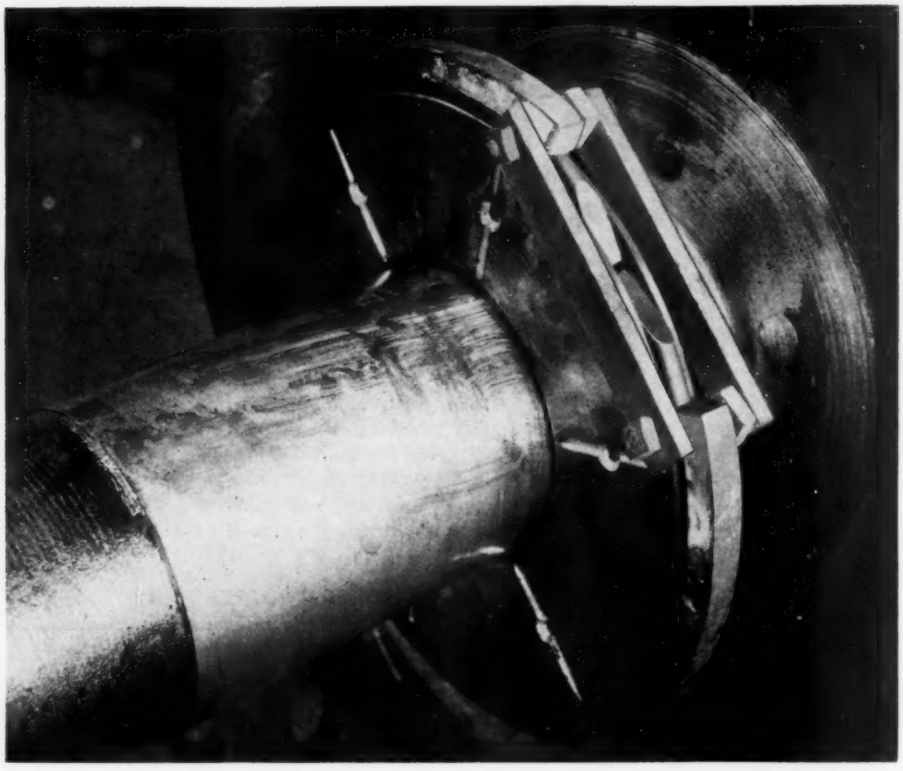
Hide glue reaches its maximum strength when it contains 10 to 12 per cent moisture, and the wheels should be dried until this moisture content has been obtained. This means that the dry room should not only be regulated for temperature, but also for relative humidity. Suitable drying conditions are 85 F. and 50 per cent relative humidity. If these conditions are maintained with reasonable accuracy, most one-coat polishing wheels can be dried within 24 hr. and two-coat wheels within 48 hr.

Other drying room conditions giving satisfactory results are a temperature of 75 F. and 45 per cent relative humidity, or 90 F. and 55 per cent relative humidity. If a polishing wheel is over-dried, it will have a short life and the abrasive grains will tear out the glue before they do their maximum work. When a wheel is under-dried, the glue does not attain its maximum strength. Such a wheel will cut slowly, glaze rapidly, and sometimes chunks will fly off. The table is offered as a general guide. The abrasive is Alundum unless otherwise specified.

Abstracted from *"Grits and Grinds"*, Vol. 28, No. 1, published by the Norton Company.

Parts	*Polishing Operation*					
	1st	*2nd*	*3rd*	*4th*	*5th*	*6th*
Axes	46–60	70–90	120	150–180*		
Aluminum, sand cast (Inside-Bottom)	36–46					
Aluminum, sand cast (Outside)	60–80	120–180	Buff			
Aluminum, die cast	150*	Buff				
Aluminum, sheet	120*	180*	Buff			
Auto Bumpers	60–90	120	150–180*	220*		
Auto Headlights	180–220*	Buff				
Band Saw Steel	60–80	120–150				
Brass, sand cast	60–80*	150–180*				
Brass, sheet	180–220*	Buff				
Electric Irons	80	120*	150*	180–240*		
Gray Iron, pickled	80	120–150				
Gray Iron, not pickled	70	120–150				
Hammer Heads	46–60	100–120*				
Knives—table and steel blades	80–90	120–150*	220-F { double header machine	Buff { Porter McCloud Machine		
Knives table backs	46–60					
Knives Machete edges	46–60					
face	80	120*				
Locomotive side rods	36	60–70	120			
Monel Metal, Deep Drawn	120	150	180*	Buff		
Monel Metal, Cast	80	120	150	150*	Buff	
Monel Metal, Full Finish Sheet	180	180*	220*	Buff		
Plows	24–36	80	120–150	180–220*		
Plow Shares	36–46					
Plow Discs	30–46	70–90				
Shears, tinsmith	46	60	120–150	180		
Shovels, blades	36–46	120				
Shovels, straps	36–60		120 (belt)			
Stainless Steel, Mirror finish	60–80	100–120*	150*	220–3F*	Buff	
Stainless Steel, Commercial finish	80	100*	120*	150*		
Wrenches	30–46	80	120*			
Lenses						
Lenses, Prescription	60–80	180–220	Optical Flour	Rouge		
	60–80 Crystolon	180–220	Optical Flour	Rouge		
Lenses, Telescope	60–80	180–220	320	Optical Flour	Optical Flour	Rouge
Glass Bevelling	70–90 Crystolon	120–150	220	Pumice	Rouge	
Granite Polishing	60–80 Crystolon	120–150 Crystolon	F Crys.	3F Crys.	{ Buff tin oxide	

*Denotes grease or oil wheel.



A split ring with the ends beveled is placed around the brass halves of the hub liner and then bronze welded

Floating Liners

Held by Weld

FRED H. COLVIN
Editor

HUB LINERS, for taking the wear caused by side motion between main bearings and driving wheel hubs, have been one of the problems of locomotive maintenance for a number of years. They have varied from the "wear plates" cast on the side of the driving boxes to similar plates cast in the drivers. Brass and babbitt are used in both places, not to mention hardened and ground alloy steel plates on the D. T. and I. when Ford rejuvenated the derelicts that he bought with the right of way. On one large road the wear plate is cast, together with the crown brass, directly in, or on, the driving box casting.

Boiler plate steel, also used for hub liners, is faced on both sides and either fastened in the recessed hub of the wheel or left free to float between the box and the wheel. In fact, the choice of fixed or floating hub liners has given one of the many opportunities for argument and diversified practice in railway work.

Split Hub Liners

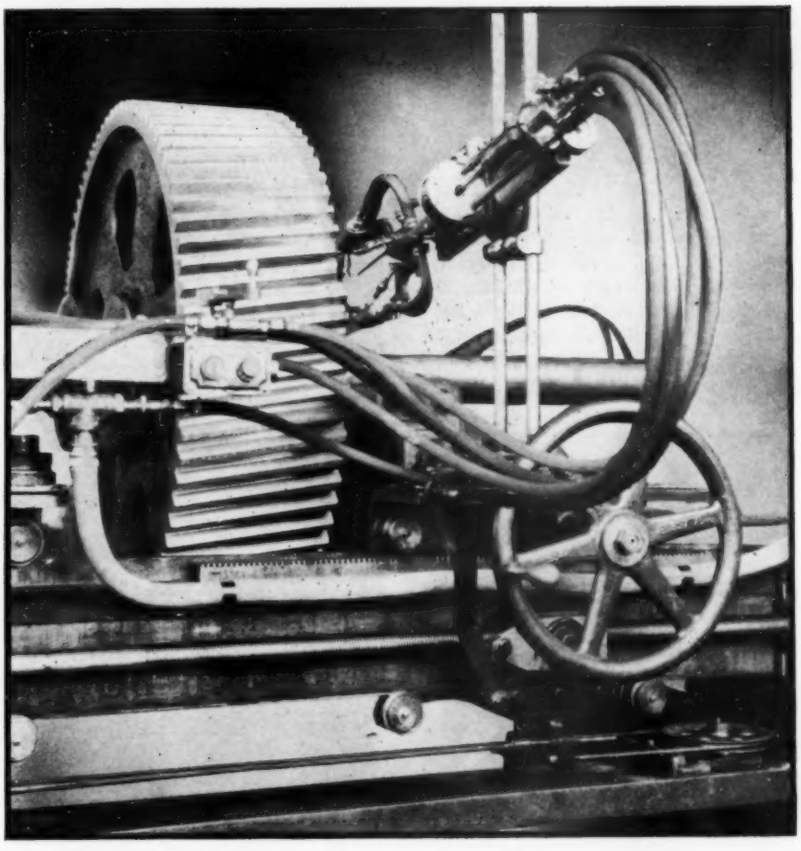
Where floating hub liners are used, they must either be put on the axle before the wheel is mounted or split and held in some way after being put in place. As renewals are frequently necessary while wheels are in place, split hub liners are common practice, and floating bushings are much in vogue.

The liner shown illustrates the practice of the Lehigh Valley Railroad in its shop at Sayre, Pa. The liner is of brass, faced on each side, drilled through for lubrication and grooved radially through the oil holes. A half round groove is turned in the outer edge.

Halves of the liner are held together by a band of round steel, formed to the right diameter and the ends beveled inside the clamp. This clamp draws the ring tightly in place, and the ends are then fastened by welding with a bronze rod. The weld joins the ends and also ties the ring solidly to the liner itself.

The driving wheel hub indicates that a former hub liner was fastened to it by studs. The plugs show where the stud holes have been filled and the surface refaced to present a smooth surface. This method of holding the halves of the hub liner by brazing or welding gives good results and has proved satisfactory. The retaining ring can be easily removed when necessary.

Shop Equipment News



Farrel-Birmingham Selective Gear-Tooth Hardening Machine

Farrel-Birmingham Co., Inc., 344 Vulcan St., Buffalo, N. Y., has announced development of a torch-hardening machine claimed to be especially suitable for efficiently hardening teeth of large gears. Although the machine has been designed especially to harden double helical or herringbone teeth, it is equally suitable for hardening single helical or straight tooth gears. It will also harden splines and rolling-mill wabblers, as well as sprocket wheels and other similar articles.

The machine consists of support rollers on which the gear arbor is mounted and two separate torch heads, with which the hardening is accomplished. Each head carries two sets of torches, or tips, so that both sides of a tooth are hardened simultaneously. In operation one torch head starts hardening at one end of the tooth and the other torch head at the other end of the double helical tooth. The torches travel towards the center, or apex, of the tooth. Traverse of the heads is horizontal and a guide roller, fixed on the torch saddle, engages the gear being hardened and thus revolves the gear in correct relationship to the horizontal traverse of the torches. This guide pin also acts as an indexing finger.

This torch-hardening equipment permits hardening of the tooth surfaces without appreciable distortion and, when properly carried out, it is claimed to be successful for relatively coarse pitch teeth. It can be applied to teeth of pitches from 6 to 1 DP. Since gears of finer pitch teeth are usually of small enough diameter to be hardened in a furnace without great distortion, the range of usefulness of this equipment is for gears of 6 DP and coarser pitches.

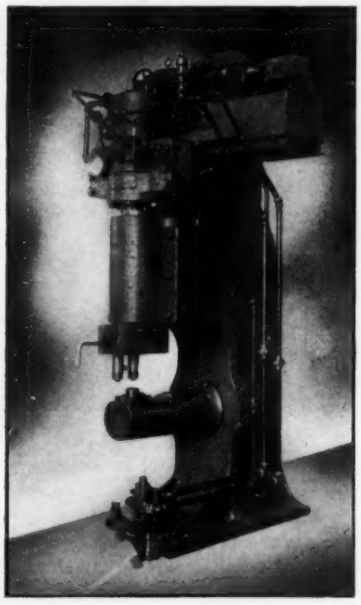
Rate of travel of the torches, with the attached water jets for quenching, can be regulated by turning the handwheel of a variable speed gear. The usual rate of traverse is from 6 to 10 in. per min., varying with the size of tooth to be hardened. Each torch head is fitted with a pilot light for igniting the main torches. This pilot light, together

with the gas supply to the main jets, is controlled by one lever. Seven different sizes of tips, or burners, are suitable for the range of work for which the machine is designed.

Maximum capacity of the machine is a gear 85 in. diameter with a 24 in. face. Over-all dimensions of the machine are 6 ft. 8 in. wide by 9 ft. 6 in. long. The water tank, forming the base of the machine, has a capacity of 250 gallons. A centrifugal motor-driven pump is provided with a suitable relief valve and other necessary fittings so that the water pressure is kept constant and at correct volume.

Chambersburg 75-Ton Hydraulic Press

Designed for inserting and closing 1-in. boiler spuds in two operations on 12- to 24-in. diameter boilers, this 75-ton hydraulic downward-acting press is manufactured by Chambersburg Engineering Co., Chambersburg, Pa. Height above floor to the spudding die is approximately 38 in. Spuds may be set 20 in. from the end of



the shell to the centerline of the spud.

The frame of this press is cast steel and weighs approximately 9,500 lb. Ram is guided by gibs on the frame and is provided with double sliding upper die holder is set ¾ and 1 in. spuds. Stroke is 6 in. with a 16 in. open space between the face of the ram and horn at the top of the stroke. Control is by hand-operated valve located at a convenient position and provided with automatic control of the upward travel.

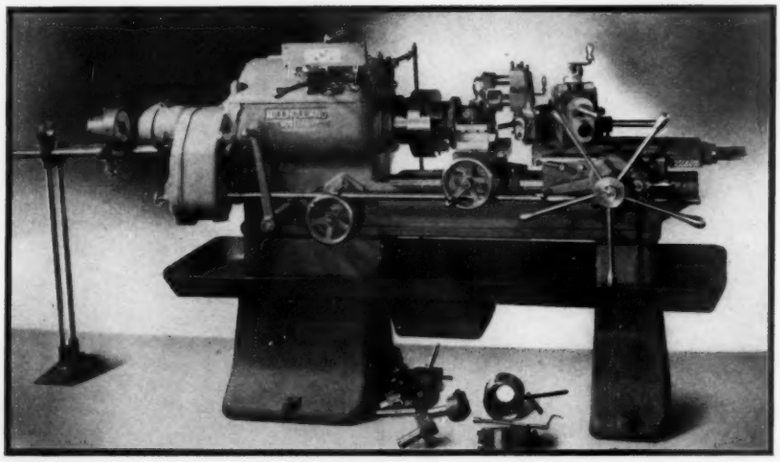
Millholland No. 4-H Combination Bar and Chucking Turret Lathe

Headstock of the No. 4-H combination bar and chucking lathe, previously described (*AM*—Vol. 80, page 1092), has been redesigned so that controls are more convenient for the operator, according to a recent announcement by the manufacturer, Millholland Sales & Machine Co., 1115 E. 35th St., Indianapolis, Ind.

Three levers control the twelve speed changes through sliding gears and clutches mounted on multiple-spline shafts. Spindle speeds are shown on an indicator mounted directly above the levers. Speed range is from 40 to 1,000 r.p.m.

Bar capacity of the machine is 1⅝ in. diameter by 9½ in. long. Swing over ways is 16½ in.; over cross slide, 7¼ in. Universal carriage has power feed in both longitudinal and cross directions.

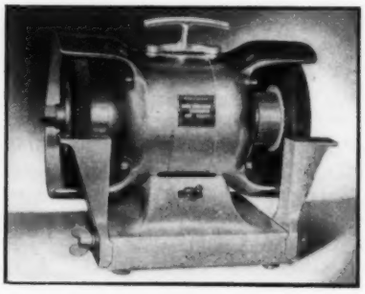
Twelve feeds, ranging from 0.005 to 0.136 in. per rev., are provided by the feed gearbox. Machine requires a 5-hp. drive motor and weighs 3,300 lb. A complete set of bar and chucking tools is available.



Black & Decker 6-In. Bench Grinder

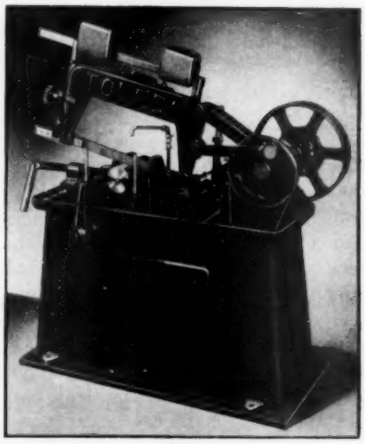
The 6-in. "Junior" portable bench grinder announced by Black & Decker Mfg. Co., Towson, Md., is equipped with ball-bearings, which are protected against dust and dirt by special sleeves. Unit is powered by a standard ¼-hp. constant-speed motor which can be obtained in standard a.c. single-phase voltages and cycles.

Specifications: over-all spindle length, 12½ in.; total height, 10 in.; height to center line of spindle, 5½ in.; net weight, 31⅓ lb.



L-W Power Saw

L-W Chuck Co., Toledo, Ohio, has announced a 6x6-in. capacity high-speed power hacksaw. This machine uses 10- to 14-in. blades and provides automatic saw relief on the non-cutting stroke. An automatic trip stops the machine at the end of the cut. Coolant pump is mounted in the base. Weight, crated, 460 lb.



Cleveland Type 48 Precision Jig Boring Machine

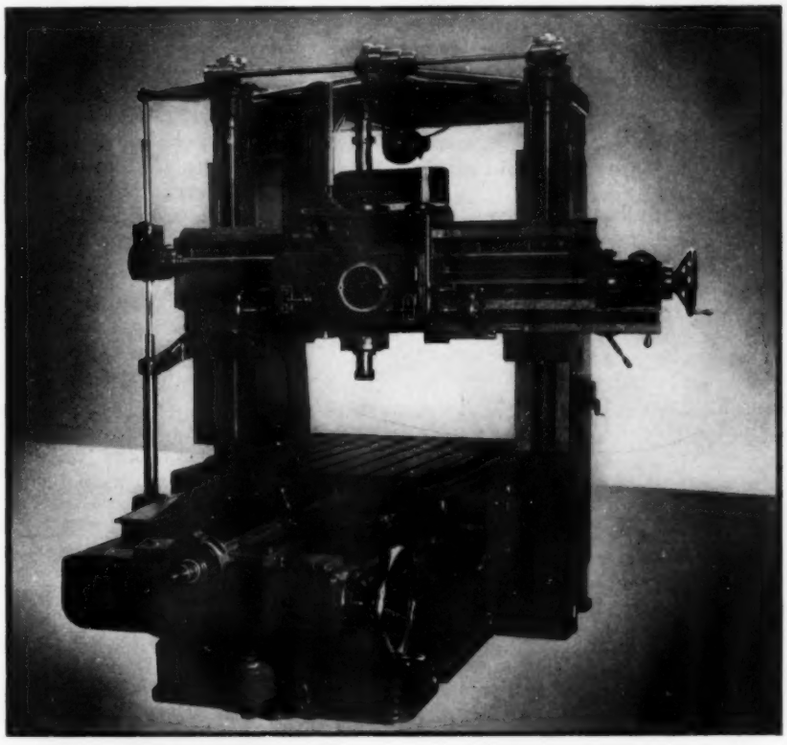
Designed and built by Cleveland Universal Jig Co., 13404 St. Clair Ave., Cleveland, Ohio, the Type 48 precision jig boring machine features accuracy of construction and ease of control. Base is of box-type design, ribbed to eliminate vibration. Table has a 40 x 60 in. working surface and is provided with eight T-slots and one aligning slot at the center. Means are provided for lubricating the table, and guarding table ways against chips.

Table longitudinal traverse screw is fitted with a 6-in. dial, graduated to 0.001 in. This dial is fitted with a vernier to facilitate closer settings. Further accuracy is provided by a vernier slide that runs the entire length of the table. Table screw is driven by a ½-hp. motor.

Crossrail is fitted with a screw for traversing the spindle saddle. Like the table, the saddle settings can be measured either by a vernier dial on the screw or by a vernier slide. Crossrail is raised and lowered by ¾-hp. motor. Saddle is traversed across the rail by a ½-hp. motor. Hand control wheels are provided for the table, saddle and spindle movements.

Spindle drive is by a 7½-hp. motor through a Transitorq to provide variable speed. Spindle nose has a 3½-in. per ft. taper. Chucks and boring tools are held in place by means of a screw retainer.

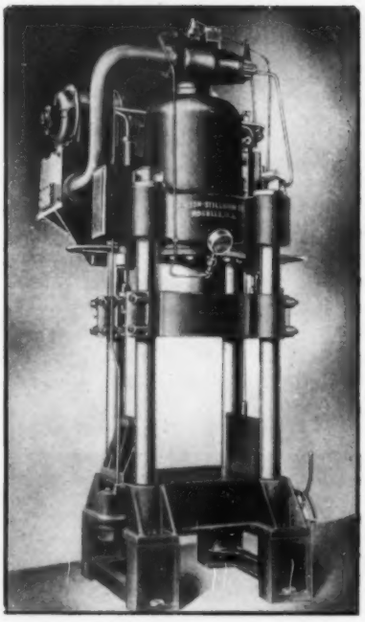
The machine occupies a floor space of 9 x 11 ft., has an over-all height of 9½ ft. and weighs 16,000 lb.



W.-S. Rapid-Action Hydraulic Press

Designed for metal forming and straightening operations, this 400-ton rapid-acting hydraulic press, manufactured by The Watson-Stillman Co., Roselle, N. J., operates under a hydraulic pressure of 2,500 lb. per sq. in. The main ram and moving platen are advanced and returned at high speed by means of two double-acting cylinders, high pressure being automatically admitted when the moving platen reaches the work. Movement of the main ram is controlled by a single lever.

Ram movement can be restricted to any part of the 24-in. maximum stroke by means of adjustable collars on the control rod. Operating speed,



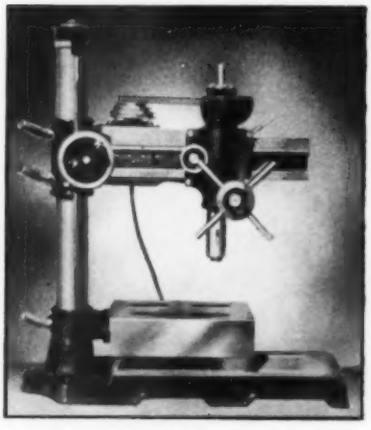
when using the maximum stroke, is nine complete cycles per min. Pressure is supplied from a variable displacement pump.

Munding 40-In. Radial Drill Press

This 40-in. bench-type radial drill, manufactured by the Munding Manufacturing Co., 703 E. Colorado Blvd., Glendale, Calif., has a capacity for drilling holes up to ½ in.

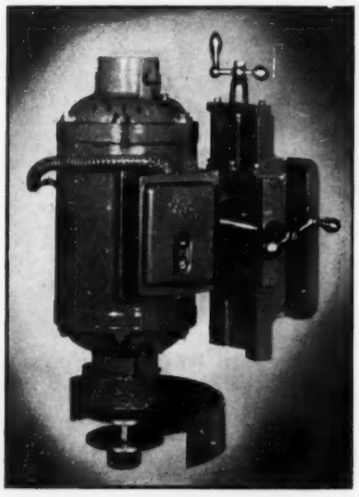
A special arrangement is used to allow rapid change of belt from one groove to another and to adjust for belt stretch. Table is movable and can be swung and tilted at any angle. Standard spindle speeds are 750, 1,500, 2,500, and 3,000 r.p.m.

Specifications: working space on base 10x25 in.; single travel, 6¼ in.; vertical travel of arm on column, 17 in.; horizontal travel of head on arm, 14 in.; net weight, 335 lb.



Standard Vertical Angle-Plate Grinder

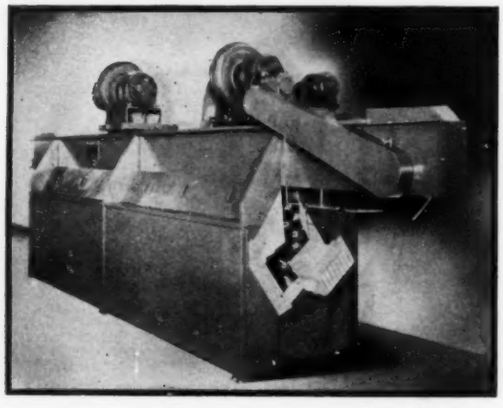
The Standard Electrical Tool Co., 1940 West Eighth St., Cincinnati, Ohio, offers vertical angle-plate grinders designed for attachment to machine tools. The grinder head, available with a flat pad, can be furnished with horizontal or vertical feed, or both. Motor operates at 3,600 r.p.m. when using a 6-in. cup wheel. Motor size ranges from 2 to 10 hp. The larger units may be had with motors operating at 1200 or 1800 r.p.m., depending on the diameter of wheel to be used.



Metalwash Blast Drying Machine

Designed especially for drying tin-plated evaporator boxes, the cold and hot blast drying machine illustrated is suitable for spotless drying all types of plated parts. This equipment is offered by Metalwash Machinery Co., Inc., 27 Haynes Ave., Newark, N. J.

Parts, after plating, are rinsed in clear, cold water, and are then passed through the machine. In the first compartment they are subjected to blasts of cold air which drive off approximately 85 per cent of the large drops of moisture, leaving only a film of moisture on the parts. This film is evaporated in the hot blast section where heated air is blown over the parts.



It is claimed that this method of drying results in practically spotless work so that final buffing for the removal of water spots is eliminated. Machines of this type can be applied to a wide variety of work, whether racked or hung individually from the conveyor.

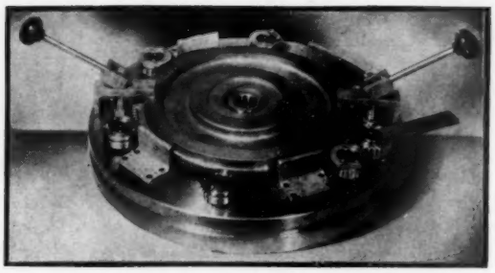
Shaw-Box "Junior" Electric Hoists

Two small low-head-room type electric hoists, built in sizes to lift 350 and 700 lb., have been announced by Shaw-Box Crane & Hoist Co., Inc., Muskegon, Mich. These hoists are

listed under the trade name "Load Lifter Junior". Distance from the bottom of the truck on which the hoists operate to the hook when in its highest position is only 12¾ in.

These hoists have a lifting speed of 20 ft. per min. with rated capacity loads and each will give a hook lift of 18 ft. Control is by pushbuttons contained in a unit suspended from the hoists. Each hoist weighs only 185 lb., complete with trolley.

Motor is of the totally enclosed ball-bearing type. Hoists are equipped with two brakes, an electrically operated motor brake and an automatic, mechanical load brake of the roller ratchet type.

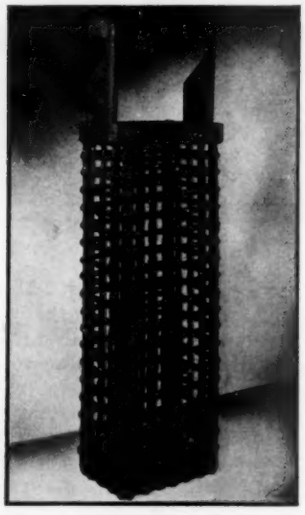


Garrison Gear Chucks

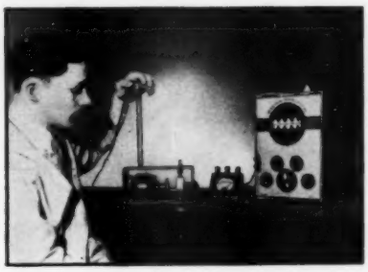
Gear chucks offered by Garrison Machine Works, Dayton, Ohio, permit accurately chucking assemblies of various kinds. Location is from the pitch line of the teeth of the chucked gear so that the final finishing operations will be concentric with the teeth of the gear. The gear chuck shown is arranged for centering and holding automobile flywheel assemblies for finishing operations. The gear is located in the chuck by members spaced at intervals around the body.

Collord Anode Scrap Saver

Scrap anodes in the plating room may be used up with the "Scrap Saver" offered by Collord, Inc., 7048 Lyndon Ave., Detroit, Mich. Basket is heavily insulated with a semi-hard



rubber and is designed to carry heavy loads. These units can be made to dimensions most suitable for use in a given plating tank. Method of use is to hang the unit on the bus-bar with a good anode in the center. Around this anode is placed the scrap material that is to be used. It is claimed that one or two loads of scrap used in this manner will more than pay for the cost of the basket.



"Sunco" Model 156 Vibration Pick-Up

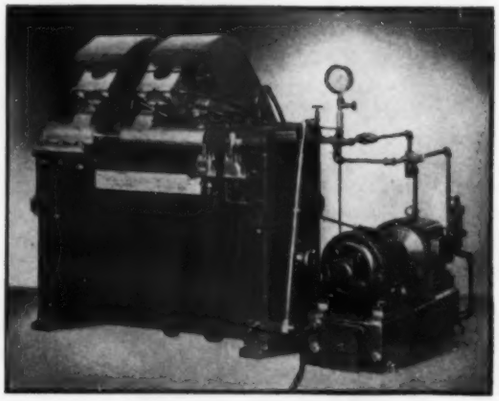
Model 156 "Sunco" inertia-type crystal vibration pick-up, manufactured by the Sundt Engineering Co., 4238 Lincoln Ave., Chicago, Ill., is claimed to be so sensitive that it will pick up the vibrations from the escapement of a wrist watch. It will withstand vibrations up to 1/16 in. amplitude. Response is linear up to a resonant frequency of 2,500 cycles. Readings are a direct function of the actuating energy. The pick-up is used in connection with a Model 150 Neobean oscilloscope.

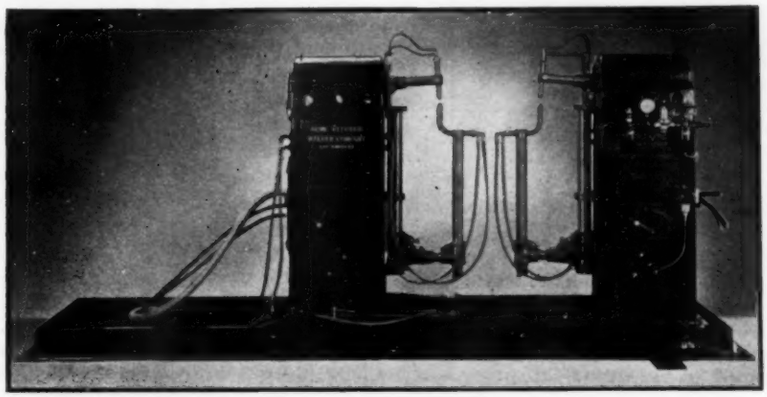
T-G Model F-21 Tube Welder

Developed especially for service in flue welding shops, the Model F-21 flash welder offered by Thomson-Gibb Electric Welding Co., 164 Pleasant St., Lynn, Mass., is equipped with a 150 kva. transformer. Push-up pressure is supplied by a hydraulic cylinder and an air pressure pump. The hydraulic pilot valve is regulated by a long lever so that the operator can govern the speed and travel of the platen more exactly than is possible with a short handle.

Dies for smaller tubes and flues are arranged so that two different sizes can be handled by one set of blocks. Separate sets of dies are required for tubes over 4 in. diameter. Dies are water cooled and are adjustable for vertical alignment. Accurate heat control is provided.

This welder has capacity for flues up to 6 in. diameter and double extra-heavy pipe up to 2½ in. diameter. Floor space required is 77x55 in., overall height is 55 in. and net weight of the complete unit is 6,840 lb.





Acme Duplex Spot Welders

Special duplex air-operated spot welders, designed for fabricating refrigerator cases, filing cabinets and similar parts, are being marketed by Acme Electric Welder Co., 5621-23 Pacific Blvd., Huntington Park, Los Angeles, Calif. Welding capacity of these units can be varied according to the installed transformer capacity. Standard depth of throat of each unit is 12 in. Opening between electrodes is approximately 1½ in. One welder is stationary and one welder is mounted on a carriage which can be moved by means of a handwheel for a minimum spread of 10 in. and a maximum spread of 58 in.

Up to 100 spots can be welded per min., depending on pressure, length of stroke, thickness and quality of stock. Electrodes and die points are water cooled and are 1 in. diameter. A pressure regulator permits any operating pressure below line or tank pressure. An automatic weld timer is housed in a cabinet for wall mounting. Shipping weight, crated, is approximately 2,200 lb.

Collord "Tem-Pro-Kote" Finish Protector

"Tem-Pro-Kote" system of protecting metal finishes during manufacture, transit or storage is offered by Collord, Inc., 7048 Lyndon Ave., Detroit, Mich. This method consists of the application of paper, or other suitable material, by means of a special adhesive. Protective material may be removed at any time without damage to the finish.

Tolhurst Centrifugal Metal Dryer

Metal dryers offered by Tolhurst Centrifugal Division, American Machine & Metals, Inc., 100 Sixth Ave., New York, N. Y., dry metal parts by means of centrifugal force and hot air which is forced through and around the parts. Recent improvements in these machines include a compact vertical motor drive for the basket and an electric heater equipped with a suitable blower.

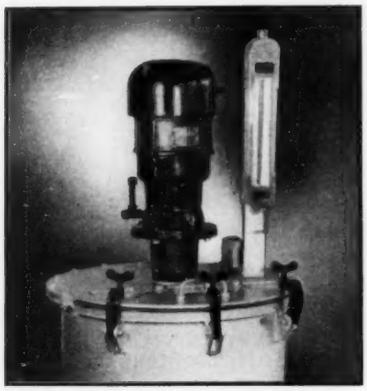
Pieces to be dried are placed in a removable perforated basket. this basket is then placed in the centrifugal and rotated at high speed. Centrifugal force throws off the moisture, while the hot air completes the dry-

ing in a comparatively short time.

Four sizes are available with diameter of baskets ranging from 12 to 26 in. Basket capacity ranges from 0.14 to 1.3 cu.ft. Drive motor for the centrifugal ranges from ¾ to 3 hp. and shipping weight ranges from 1,050 to 2,000 lb.

Binks Paint-Mixing Hydrostatic Gage

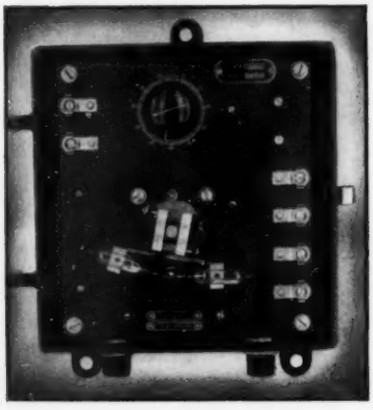
Binks Mfg. Co., 3114-26 Carroll Ave., Chicago, Ill., is offering hydrostatic gages calibrated for Binks paint mixing and pressure tanks. These gages permit control of uniformity and viscosity by "weight" mixing. A clear vision gage shows the exact weight of lacquer and thinner added to the tanks and also serves as a level indicator.



Bristol "B-Linator" Anticipating Device

A device, known as the "B-Linator", for use with automatic pyrometer controllers such as are used on industrial heating furnaces, has been perfected by the Bristol Co., South Main St., Waterbury, Conn. The purpose of this device is to enable the pyrometer controller to anticipate temperature changes and to correct the fuel consumption long enough in advance to prevent the temperature from cycling. Thus, the temperature is prevented from rising above or falling below the control point.

This device can be used with practically all of the commonly used types of pyrometer controllers and can be added to present installations as well as incorporated in the control circuit of new equipment.



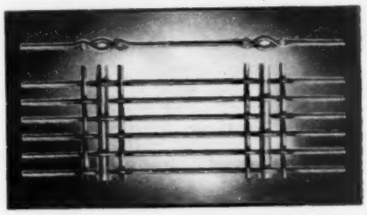
Noble & Westbrook Graduating Machine

No. 41-D graduating machine, offered by Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn., has increased capacity and is said to be easier to operate than previous models. It can be supplied for marking micrometer dials and similar articles up to 8 in. in diameter.

Work spindle is mounted on roller bearings and is removable so that different types of spindles can be used. Work and work spindle are geared to the marking die in order to hold zero line location, as well as to maintain accuracy of the graduations. Marking die, with its gear, is mounted on a bronze bushing and turns on the stationary shaft which is located in back of the work spindle. This shaft can be adjusted laterally to position the marking. Pressure is applied by treadle. A power operated model is available for use where production quantities are large.

"Sta-Tru" Wire Screen

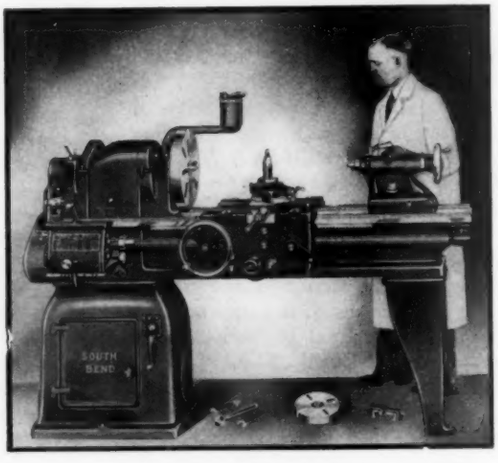
The Ludlow-Saylor Wire Co., Newstead Ave. and Wabash Railroad, St. Louis, Mo., announce improvement of the long mesh "Sta-Tru" screen previously described, (*AM*—Vol. 81, page 144). The rectangular cross bar has been replaced by an oval bar. This relieves the wire of crimping strain so that vibration will have less destructive effect.



South Bend Series R and N Precision Lathes

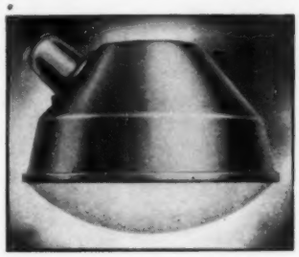
South Bend Lathe Works, South Bend, Ind., has announced the Series R and Series N underneath-drive precision lathes. These lathes are offered in 9-, 11-, 13-, 15- and 16-in. swings, and in 3- to 12-ft. bed lengths. Motor and driving mechanism are inclosed in the cabinet leg. There are no exposed pulleys, belts or gears. Power is transmitted from motor to countershaft by V-belt, then up to the headstock cone pulley by flat belt. A belt-tension release lever permits shifting the cone pulley belt.

Quick-change-gear models are equipped for cutting 48 right- and left-hand standard screw threads, ranging from 2 to 112 per inch. A number of attachments are available for milling, keyway cutting, grinding, taper turning, gear cutting, and collet work.



Westinghouse Angle Lamp Reflector

Offered by Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., this balanced symmetrical angle reflector is designed for use with the 400-watt high-intensity mercury lamp. It is recommended for applications requiring local lighting of vertical or horizontal surfaces. Two types of dust covers are available.



"Fleetweld-8" Electrode

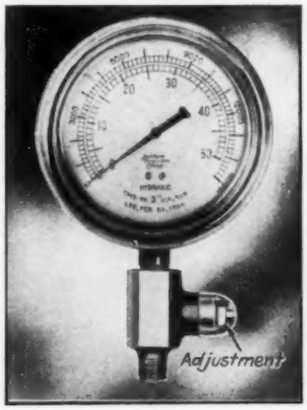
"Fleetweld-8" electrode, offered by Lincoln Electric Co., Cleveland, Ohio, is designed to eliminate the necessity of multiple-pass welding in production of fillet and lap welds. Such welds can be produced with it without undercutting or overlap. It is claimed that up to ⅜-in. fillet welds, with one plate vertical, can be produced in one pass with this electrode.

The electrode is heavily coated for welding by the shielded arc process. Welds are smooth and dense, with good physical properties.

Marsh Hydraulic Pulsation Dampener

The pulsation dampener offered by Jas. P. Marsh Corp., 2073 Southport Ave., Chicago, Ill., is a construction which protects pressure gages from the effects of excessive pulsation in pressure. The dampener functions to level off the peaks and valleys of oscillating pressure so that the indicating hand stands still or moves slowly back and forth over a limited area. This instrument is applicable to all types of hydraulic production equipment and can also be applied to air pressure, gas pressure and vacuum.

The pulsation dampener structure is made in two types, the external adjustable type as shown in the illustration and the internal type which is not adjustable in the field.



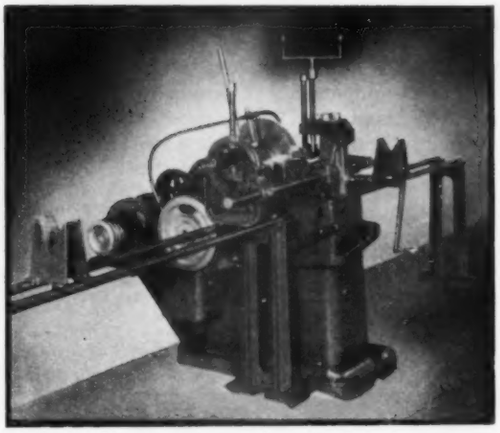
"Cleco" No. B1 Scaling Tool

The Cleveland Pneumatic Tool Co., 3738 E. 78th St., Cleveland, Ohio, is marketing the "Cleco" No. B1 scaling tool. This tool is claimed to be suitable for the removal of weld splatter and excess metal in production welding. It has also been found useful for removing sand from castings and for removing rust and old paint from tanks.

A graduated control valve, located at the rear end of the tool, automatically admits the correct amount of compressed air to the operating cylinder. Exhaust air from the tool is directed in such a manner as to blow off the chips and scale. This tool weighs approximately 3½ lb. and is approximately 11 in. long.

"Ne-Ver-Rust" Preventative

The Never Rust Mfg. Co., 1771 East 18th St., Brooklyn, N. Y., is offering "Ne-Ver-Rust" rust preventative which, when applied to metal surfaces, leaves a film coating and is claimed to make the metal impervious to dampness. This material can be applied by dipping the part, or with a brush or spray. It can be removed easily with a rag soaked in turpentine, kerosene or other dissolvant. The film will set sufficiently to enable ordinary handling within a few hours after application. One gallon will cover between 1,500 and 2,000 sq. ft. on polished surfaces.



Cochrane-Bly No. 2-B Sawing Machine

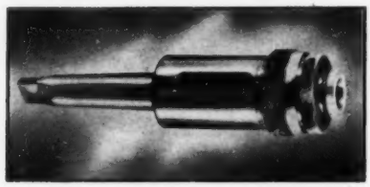
No. 2-B metal sawing machine, manufactured by Cochrane-Bly Co., Rochester, N. Y., is equipped with multiple cutting equipment for small round bars. The vise has capacity for holding eight 1⅛-in. round bars, or 118 ¼-in. bars at one time. Other sizes are in proportion. A 16-in. diameter inserted-tooth saw blade is driven by a 2-hp. motor through multiple V-belts. Lubricant pump is provided with flexible tube and distributing nozzle.

Machine can also be arranged for cutting single bars, and is provided with three changes of feed for hard and soft stock. Floor space occupied: 29x50 in.; net weight: about 1,600 lb.

Packer No. 1 Polishing Stands

No. 1 portable, vertical-type polishing and buffing stands, manufactured by Packer Machine Co., Meriden, Conn., are used in connection with polishing machines for buffing inside

surfaces of trays and similar products. An oval chuck with capacity for pieces 21 in. on the long axis is standard equipment. A handwheel controls longitudinal adjustment of stand and raises and lowers chuck for loading work. Crank mounted at side of chuck base permits adjustment of eccentric setting. Drive is by 1½-hp. totally inclosed, dustproof ball-bearing motor. Oval chucks can be furnished separately for use on latches and other machine tools.



Buhr "Micro" Adjustable Holders

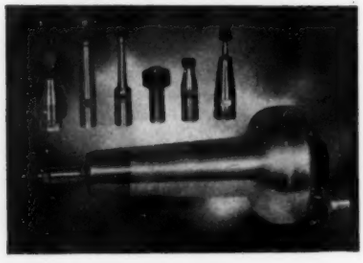
Three lines of "quicklock" adjustable holders for drills, reamers, taps and spot facers, manufactured by Buhr Machine Tool Co., 839 Greene St., Ann Arbor, Mich., have been improved to increase the strength and accuracy of the units. Construction is such that no tools are required to adjust the taper adapter or extension. A slight turn of the locking sleeve locks or unlocks the adjusting nut and a turn of the nut gives a measured adjustment in thousandths of an inch.

Micro-adjustable holders and adjustable extension holders are designed for use in the spindle of a drill press, in multiple heads, or cluster heads, and in other drilling and reaming machinery. Nose pieces are designed to incorporate a measured adjustment on the end of a drill spindle, wherever it is used.

Onsrud No. E-1 Turbine Grinder

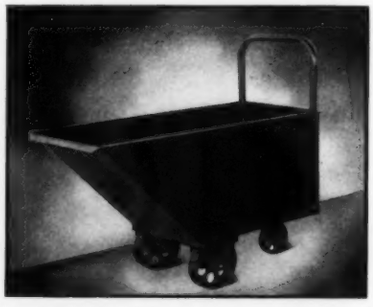
Developing ½ hp. and 38,000 r.p.m. on standard factory air pressure, the No. E-1 pneumatic turbine grinder offered by Onsrud Machine Works, Inc., 3921 Palmer St., Chicago, Ill., has no wearing parts other than the bearings. These are oil lubricated and are kept cool by expanded exhaust air. It is claimed that this tool will operate continuously at less than room temperature. Various extension spindles are available.

Specifications: weight, 4¾ lb.; length over-all, 10 in.; largest diameter, 4⅛ in.; air pressure required, 90 to 100 lb.



Collord "Surfaseal" Brushing Rubber

"Surfaseal", a liquid rubber which can be brushed on surfaces for their protection, is furnished by Collord, Inc., 7048 Lyndon Ave., Detroit, Mich. This rubber paint is available in black, gray, or brick-red color. Two types are available. No. 2 is used for protection of metal surfaces, such as tank exteriors and exposed metal structures. It may also be used for lining weak acid tanks. Surfaseal No. 3 may be used for floors, walls and concrete structures.



"Clark" Scrap Trucks

Two scrap trucks have been added to the "Clark" line of material handling equipment offered by the All Steel Welded Truck Corp., Rockford, Ill. Standard truck bodies measure 46 in. long at the top, 27½ in. long at the bottom, and 18½ in. deep. No. 10 gage metal is used for the truck body and the unit is electric welded throughout.

Standard equipment includes two 9 in. diameter semi-steel wheels with roller bearings, and one caster with a 6 in. wheel. As optional equipment the truck may be equipped with front leg and lock pin assembly for the "Clark" lift-jack in place of the caster wheel, shown in the illustration.

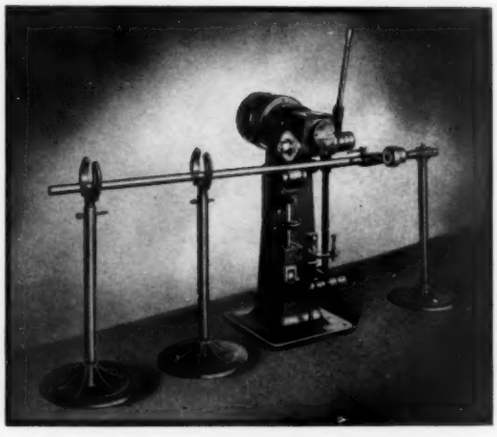
Spray No. 14-B Paint Gun

Spray Engineering Co., Central St., Somerville, Mass., has announced changes in design and construction of the No. 14-B spray gun. Nozzle parts

and inner connections are now of stainless steel and the air-valve construction has been improved to give more accurate control. One-piece gun-body is of drop-forged aluminum. Spreader has stainless-steel inserts. All fittings are chromium plated.

Murchey Model F Pipe Cutter

Model F roller pipe cutting machine, announced by Murchey Machine & Tool Co., 951 Porter St., Detroit, Mich., has capacity for ½- to 2-in. pipe. Cutter wheel is a thin heat-treated tool-steel disk. Rollers, which support the pipe, are raised to the revolving cutter by a combination hand and foot lever control. Cutter shaft is hardened and ground and operates in anti-friction roller bearings. The machine can be fitted with a set of small rollers for ⅛- to ⅜-in pipes. Cutter is driven by a 2-hp. motor with direct drive through an hourglass worm.



Round Table

The Conscientious Workman

"Al, I've a real nut for you to crack this time. It's got me stumped."

"How's this, Ed?" Al settled back in his chair and proceeded to fill his pipe. "I thought you knew all the answers."

"Well, here's one I haven't been able to figure out. You know Henderson, of course?"

"Yes, he's one of the best mechanics you've got. Learned his trade a good many years ago and is almost too thorough."

"That's just the trouble now—I've made him responsible for repairs and adjustments on those semi-automatic assembling machines we designed and built a year or so ago."

"Those are the units you had so much trouble with, aren't they?"

"Yes, they require some rather delicate adjustments and some of the parts have to be carefully fitted."

"Henderson is probably the right man for the job, then. You don't have a more conscientious man on the payroll."

"I know it, but he seems to think that all of the fits have to be just as close as those in the control unit. He makes every part to the same close tolerances and carefully polishes every surface."

"That takes a lot of time and can be quite expensive."

"You're right—it is expensive. I've talked to him about it several times but he thinks that everything has to be perfect in order to keep the machines working."

"There is, of course, another side of the picture, Ed. The better Henderson does each repair job the longer the machine will function between breakdowns."

"That is true in some cases—but it certainly doesn't justify the time he spends fitting parts that do not require the delicate adjustment he gives them."

"He probably feels that you want sloppy work on those parts."

"Certainly not, but there are degrees of fit and finish. I only want him to differentiate between those jobs that require close fitting and those that do not."

"What do you plan to do?"

"Well, there's only one thing to do if he can't learn to give the job only what it needs. I'd hate to lose him, too."

"Better explain the whole thing to him before you make up your mind, he'll be a hard man to replace and he does know how to keep the machines going."

"Sure he does, but the cost of doing so is twice what it ought to be."

Should Ed tolerate expensive fitting on all parts in order to insure close fits where necessary? How can he get Henderson to differentiate between fits without endangering his interest?

Discussion

Shouting Foremen

The ability to use good methods of personnel management by means of which they are able to get work done with minimum trouble is possessed by successful foremen. Personnel management implies ability as a disciplinarian. In a narrow sense, discipline indicates some form of punishment, but in the best sense it means dealing with an individual so that he will work efficiently and conduct himself properly. Shouting foremen are violators of efficient personnel management. They are not dealing effectively nor efficiently with the problems involved. Antagonism and discontent are outgrowths of slave driving. Good management-employee relationship necessitates relegating the hell-raising foreman and his methods to the junk pile.

Good foremanship implies the ability to see with intelligence and discrimination special methods for handling difficult situations. A good foreman has the ability to appreciate the difficulties and problems of the worker and to adjust them amicably for the better conduct of the plant as a whole.

For eliminating the tendencies of driving and hell-raising in foremen, participation in foremanship classes where the object is the improvement of foremen in the discharge of their

responsibilities is advocated. After a few suggestions from an understanding superintendent to the hell-raisers, their offensive tendencies may have "Gone With the Wind."

—HARRY KAUFMAN
Industrial Department,
Philadelphia Navy Yard.

It may be there are a few men in Williams' employ who need to be driven and yelled at in order to make them work. If so, it would be to the firm's interest to get rid of such men and not to hire a driving, hell-raising boss, who might cause the good old standbys to leave. No self-respecting, skilled workman will stand such tactics for any length of time.

The outcome will be a reduction of production, for when the percentage of labor turnover increases production decreases, and quality suffers when breaking in new men.

If a man must get "bawled out" once in a while for a poor job, the efficient foreman will do it quietly and privately, and he will also realize that when a man does an unusually good piece of work a word of praise is due. It will not be necessary to shout the praise from the housetops. —HUGH M. MITCHELL.

When I was a machinist I worked under a foreman who seemed to think that a part of his job was to browbeat and bully every man who worked under him, whether the man did his work well or not.

When I became a foreman I adopted the plan of making friends with every man who worked for me. Those I couldn't make friends with were sent elsewhere. If any one of my men made a mistake in his work, instead of concealing it from me for fear of a reprimand, as is general, he would tell me about it so that I could help him.

If I said, "Men, these machines are badly needed for shipment to impatient customers, can't we speed up a bit?" To a man they set a pace and the machines were finished ahead of time. When my cost sheet for the machines was sent in to the office, the manager sent for me and said, "You have made a mistake on your cost sheet for the last lot of No. 16 machines. Take it back and look it over. These machines were never made for such a low figure since we have been in business." When I assured him that my figures were correct, he asked how I did it, and I told him that the men gave me the best that was in them.

—C. G. TREFETHEN.

It was a pleasure to me to be an eye-witness to the final chapter of a hell-raising individual. This rumpus-creating jackass, commonly known as the millwright foreman, walked up and down the shop urging his men along with brimstone-coated invectives as they erected a gantry-crane runway within the floor of the shop. He wore a swallow-tail coat while on the job thinking, no doubt, that it would lend dignity to the occasion. His main exhortation was: "Get the —— —— thing done."

Well, it was 'done,' and how! God evidently had a hand in it because after the concrete had hardened, as it will in time, it was found that the tracks were not the same distance apart as were the wheels on the gantry! The hell-raising ended right there and instead of the usual bad words there was a cold-sweating individual stripped of all his glory amid a Sunday-school silence. His hell-raising highness left the shop in a hurry. —J. HOMEWOOD.

No foreman schooled in the psychology of modern foremanship need resort to tongue lashing in order to maintain an effective department. The proper training of workmen, especially new employees, in their specific duties is of basic importance in maintaining a comparatively trouble-free department. A foreman who is successful in accomplishing this will very seldom be tempted toward hell-raising tactics.

There is only one remedy in dealing with foremen who are chronically affected with loud-mouthed tactics and that is to give them a good dose of their own "medicine."

—PETER L. BUDWITZ.

Tool Tickets

Both the tool ticket and the brass check have good and bad points. The greatest objection to the tool ticket is the time taken to fill it out. However, it has the advantage that a man can get all the tools for a certain job at one time. Having a copy of the tool ticket, the man knows just what tools are charged against him and the toolcrib attendant knows what tools are charged against any particular man. The brass-check system has dangerous possibilities. Chaos has resulted from someone bumping against a row of pegs containing checks for tools that have been issued, the checks ending up on the floor.

The following system is a sort of compromise between that of the brass check and the tool ticket: Each man is given the usual number of brass checks bearing his clock number. For each tool in the crib there is a tool check bearing a brief description of the tool it represents and is kept with that tool in the crib.

When a tool is issued, the tool check is replaced by the man's check and the tool check is hung on a board having a peg for each man. By this means a cross index is obtained showing what man has a specific tool and what tool a specific man has. When the tool is returned, the tool check is exchanged for the man's check, the man receiving his check and the tool check being put with the returned tool. —O. W. WINTER.

How Interchangeable?

Can parts be made strictly interchangeable? Why not? The tools must be right; the machines must be in good condition and enough time must be allowed the men to do the work properly.

Two of the fallacies of the machine shop are speed and time. They often lead to careless workmanship in machining and then a waste of time in assembly, trying to make the parts fit. A little more time taken and a little more care used in finishing; drills, taps and reamers watched more closely; jigs and fixtures checked for any discrepancies that may have developed will save time for the assemblers. —P. H. PEARSON.

To the Lowest Bidder?

When one bid is considerably lower than the others, the cause of the difference in price should be investigated. The shop management should estimate the approximate cost of the work just as if it were going to do it. It is good policy to pay a fair price for work and not to favor cut prices. But a low bid can often be satisfactorily explained. For instance, a shop may specialize in work of the kind and have specially experienced men. Its overhead may be low and it may have a good purchasing system and sufficient capital to buy material when prices are at the lowest.

The concern may give little or no credit, and if it has no bad debts it can often quote a low price to get work and establish itself. Contracts should not be awarded on price alone, though price must be the principal factor or the competitive spirit will disappear. —W. E. WARNER,
Sompting, Sussex, England.

VOLUME 81 • AMERICAN MACHINIST, ESTABLISHED 1877 • K. H. CONDIT, F. H. COLVIN, EDITORS • NUMBER 10

Editorials

The Pricing Problem

DEPARTMENT store advertisements are advising potential customers to buy before prices go up. Many readers will discount this advice as a hackneyed sales argument, but they will probably regret later that they did not take it. We are in the inflation period of the business cycle, or, as one economist puts it, we are in the grip of an inflation psychology. And that means rising prices.

Consumer goods turn over relatively rapidly, as a rule. It is not necessary, therefore, to gamble very far into the future when setting prices on them. Capital equipment, on the contrary, turns over slowly. Furthermore, the builders of this equipment are now so loaded up with orders that the normal manufacturing cycle has been extended by several months. How shall prices be set on machines ordered today for delivery next fall, or even next year?

Suppose we take machine tool prices as typical of the capital goods price situation. Some builders have raised their prices as nearly commensurately with the rises in their own costs as possible. This policy is all very well where delivery dates are not very remote. But what is their position if labor and material costs rise sharply before delivery can be made?

Hedging on materials by ordering well ahead is recommended by one school of thought. That will help if the purchasing agent is a shrewd buyer, but if it becomes general practice it will hasten increases in material prices.

But you can't do much hedging on labor costs or on taxes so long as Congress is in session and the Administration is of its present mind. Labor organizers have not been slow to accept the New Deal's invitation to regiment factory workers. How far the movement will spread, and how much it will increase labor costs of machinery are unpredictable. Yet prices must be high enough to cover these potential additions to cost if the builder is to continue operating at a profit.

Some builders have refused to quote firm prices beyond a definite date, usually four months ahead. And buyers who operate on strict budgets have been put in a difficult position as a result. Other builders have set a limit to the number of orders they will accept at a fixed price. This policy has perhaps not aroused so vigorous an objection, but it has not helped the buyer who needs machine tools and has waited too long to place orders. Even so it is wiser than a policy of charging all the traffic will bear, which is indefensible.

A MAN WHO has been fifty years in the machine tool business says that in each ten-year period there are three dull years when losses are unavoidable, three active years when profits are probable, and four years when it is a toss-up whether the books show red or black. Obviously, the machine tool builder must make enough in the three good years to carry him through the seven lean years. If buyers would remember this, and would also admit how much more they make out of every machine they buy than the builder makes, they might be less critical of pricing policies that are set with at least half an eye to the future.

Union Absurdity

A SPLENDID EXAMPLE of the absurd lengths to which restrictive unionism can go under bad leadership is reported from San Francisco. The story is that the local electricians' union forced a purchaser of an electrically controlled machine tool to have all of the wiring removed and reinstalled by members of the union.

This sort of thing is not new to machinery men who have had to contend with the same attitude at exhibitions in several different cities. But its absurdity is apparent. If electrical equipment must be installed by members of a local electricians' union why should not the local machinists' union take the same stand regarding the mechanical parts? And why shouldn't the painters insist on having the paint removed and a whole new paint job put on?

To simplify the question still further, why should any machine tools be built in factories, or any other kind of machinery for that matter? If the electricians can insist on having all work done locally, why should any work be done elsewhere? The result, of course, would be an overturn of the whole industrial system, and a rise in costs of machinery, and everything machinery makes, that would set us back a century or two in our civilization.

Wise labor leaders should be the first to squelch this sort of thing, because if it spreads their whole structure will come down like a house of cards.

CHIPS

WASHINGTON

Supreme Court hears arguments on validity of Social Security pension taxes . . . House discusses economy measures but will probably end up by doing what Roosevelt wants although there is growing evidence of dissatisfaction with the drifting policies in Congress and the administration . . . Federal government has achieved one low record to offset its many high ones, army cost per capita is only $3 a year, a fraction of what other countries are paying . . . Advisory council of experts appointed to study Social Security Act and recommend needed changes . . . Congress gets railway pension bill amending present retirement act to agree with provisions worked out in conference by executives and employee representatives . . . Kennedy says Maritime Commission will use its facilities to expedite building up of foreign commerce services and ships, coastwise and lake ships to come later . . . House refuses to make CCC permanent, extends it for two years, committee cuts relief to one billion.

FOREIGN

British and French ships, convoyed by men-of-war, evacuate Basque refugees from Bilbao as troops dig in to repel Italian and Moorish attackers . . . George VI is crowned in Westminster as officials of the British commonwealths confer on major policies . . . Mussolini withdraws Italian correspondents from England and bars all but three English newspapers from Italy . . . Agrees with Hitler to ignore League of Nations . . . Soviet dictators facing same worries over revolutionary plotters that worried the Czars . . . French industrial truce extended for six months . . . 60 per cent of Japan's scrap iron to go into armaments . . . Goering cancels Graf Zeppelin's flights pending findings of investigation into cause of Hindenburg catastrophe . . . Bus strike hinders celebrations in London, other British strikes portend. Mexico puts heavy income tax on American firms to force establishment of branches there . . . Canadian premier urges extension of trade treaties of the Hull type.

FINANCE

Sale of Van Sweringen control to be investigated by Senate committee . . . Treasury investigation of unexpectedly low first quarter income tax returns to be widened . . . Steps taken to shorten tax litigation.

INDUSTRY

C.I.O. refuses to recognize building trades locals organized by Commerford, tax evading former Tammany labor leader . . . Packard agreement making U.A.W.A. sole bargaining agency ratified by men, no strikes for a year promised . . . Movie magnates avoid actor strike by yielding to Guild demands in Hollywood . . . Republic Steel declines to sign contract with union, claiming that demands are already equaled or exceeded by existing policies . . . Philadelphia plant of Brill Car Co. closed by strike . . . Phelps-Dodge planning to spend forty millions on plant modernization. Strike at Jones & Laughlin steel plant ends as company agrees to recognize as sole bargaining agent winner of election to be supervised by N.L.R.B. . . . Another wave of strikes closes several General Motors plants . . . U.A.W. announces drive to organize Ford, who replies with statement giving reasons why men are foolish to join unions . . . Emerson and Century Electric strikes settled . . . Lewis and Green exchange recriminations and dispel hopes of labor peace.

INDICATORS

Steel production holds steady at 92 per cent of capacity . . . Metal trades employment above 1925–27 level . . . Business Week's index up slightly to 78.3.

A.W.S. Managing Director

WARNER S. HAYS

Warner S. Hays, Manager American Welding Society

The appointment of Warner S. Hays as managing director of the American Welding Society, 33 West 39th St., New York, N. Y., has been announced by A. E. Gibson, president. Mr. Hays' selection is a part of the program adopted by the board of directors of the society which is expected to increase membership and to give better service to its members and the welding industry.

After graduation from Yale, Mr. Hays worked for the General Electric Co., from which he went into the public utility field in Illinois. For a time he was circulation and field manager of the McGraw-Hill Publishing Co. at New York. Since the war he has maintained a consulting engineering and association executive office in Philadelphia.

General Motors Opens Linden Assembly Plant

The Linden, N. J., plant of General Motors Corp., has been completed and put into operation under the direction of W. S. Roberts, general manager. The first car to roll off the new assembly line marked the official start of a production operation capable of supplying 120,000 Buicks, Oldsmobiles and Pontiacs a year.

The plant occupies an 80-acre site on State Highway 25 and Edgar Road, and was erected at a cost of $5,575,000. When operating at full capacity it will provide employment for approximately 2,000 persons. The completion of this plant provides the company with an Eastern outlet and marks another step in the decentralization of the production of automobiles by General Motors. A similar plant was established in Los Angeles, Calif., last year to serve the West Coast region. Prior to that time Buicks, Oldsmobiles and Pontiacs had been assembled only at the parent plants in Michigan.

More Than 5000 Attend A.F.A. Annual Convention

The 41st annual convention of the American Foundry Association held in Milwaukee, May 3-7, set new all time records in attendance and interest. More than 5,000 registered for the various meetings and inspection tours. The upward trend in foundry business indicated by the attendance was also reflected in orders for new equipment at the exposition which completely filled the Milwaukee auditorium. More than 200 concerns exhibited products.

Dr. James S. Thomas, president, Chrysler Institute of Engineering and Clarkson College of Technology, defended the machine civilization in his talk as main speaker at the annual banquet.

The annual stag dinner and entertainment proved to be the largest single assemblage of foundry men with an attendance of 1200. Speakers included Robert S. Hammond, vice-president, Whiting Corp., Harvey, Ill., and president of the Foundry Equipment Manufacturers' Association; W. S. Bornfleth, manager, foundry division, Cutler-Hammer, Inc., Milwaukee; and James L. Wick, Jr., Falcon Bronze Co., Youngstown, Ohio.

Mr. Wick, retiring president opened the convention with an address which keynoted the discussions and meetings of the convention. He made a plea for further interest in improving foundry practices and economical production through activities of the association. He asked for improvement of labor conditions, pointed out the current serious shortage of skilled foundry labor, and emphasized the need of apprentice training.

Officers elected at this convention were: Hyman Bornstein, president, director of testing and research laboratories, Deere & Co., Moline, Ill.; Marshall Post, vice-president, vice-president and general manager of the Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; directors, H. B. Hanley, American Laundry Machinery Co., Rochester, N. Y.; Duncan P. Forbes, president and general manager, Gunite Foundries Corp., Rockford, Ill.; Thomas Kaveny, president, Herman Pneumatic Machine Co., Pittsburgh, Pa.; C. J. P. Hoehn, president, Enterprise Foundry Co., San Francisco. Clarence E. Sims, supervising metallurgist, Battelle Memorial Institute, Columbus, Ohio, was elected a director of the Association to serve for the unexpired term of Mr. Post.

John W. White Promoted by Westinghouse International

At a meeting of the board of directors of the Westinghouse Electric International Co., J. W. White was elected vice-president and general manager. He will make his headquarters in New York City.

Mr. White entered the employ of the Westinghouse Electric & Mfg. Co. in 1905 and continued in the main works at East Pittsburgh until 1912. In 1917 he filled the position of manager of the central station and transportation division of the Detroit office. Beginning in 1918 he served the export division in Cuba, Japan, and Argentina.

S.A.E. Summer Meeting Papers Attract Many

Some 700 delegates attended the annual summer meeting of the Society of Automotive Engineers which opened May 4 at The Greenbrier, White Sulphur Springs, W. Va. Technical representatives from Japan, England, South Africa, Netherlands and this country heard 32 papers covering many phases of research in and design of automobiles, engines and fuels. The first trailer exhibit ever held in conjunction with an S.A.E. meeting attracted considerable attention.

J. H. Hunt, General Motors Corp., spoke to over 300 at the Thursday evening, May 6, session on safety in car design. He stated that every driver presented an individual problem to the designer and engineer, in that every driver reacts in a different way to safety factors. "Little in engineering and design can be done except to keep pace with the new inventions and safety developments."

Alexis de Sakhnoffsky, engineering stylist, and Frederic A. Selje, Chrysler Corp., spoke on car body design.

H. R. Ricardo and J. H. Pitchford, Ricardo & Co., Bristol, England, spoke on the recent trends and developments in European automotive diesel-engine design.

Machine Tool Exports May Show 40 Per Cent Increase in '37

C. N. Kirkpatrick's prediction based on business of first quarter; export limits and conditions in various countries outlined

Machine tool exports for 1937 may total $41,000,000, according to C. N. Kirkpatrick, secretary and sales manager, Landis Machine Tool Co. Mr. Kirkpatrick made this prediction at the 35th spring convention of the National Machine Tool Builders' Association in his capacity as chairman of its committee on foreign trade. He based this figure on the first three months exports of $10,200,000. The total for 1936 was approximately $28,200,000.

Mr. Kirkpatrick pointed out that the percentage of foreign sales does not vary much from year to year, being in the neighborhood of 20 per cent, and went on to outline foreign conditions which have affected export of American machine tools.

He stated that sales to Germany had been seriously restricted because of the inability of German customers to export money to pay for American machine tools. Restrictions in Czechoslovakia have been relaxed so far as machinery is concerned, and since January 1, 1937, import permits have been easier to get. These permits must be secured from the National Bank of Czechoslovakia before the necessary foreign exchange can be secured. Hungarian orders should not be accepted until irrevocable letter of credit has been established in New York. Italy has established a definite allotment which cannot be exceeded, but permits within that allotment can still be secured. Sweden has no restrictions that handicap our trade, and the credit situation is excellent. Norway requires an import permit which is easy to get.

In Poland restrictions have been in force since April 1936; their foreign exchange commission must approve every transaction; payment is made through the Bank of Poland. Australia imports only on permit, on a reciprocal basis, and this permit is almost impossible to get. Their trade balance with this country is unfavorable to Australia and their government desires to reduce purchases from the United States. France, however, is open, there being no import restrictions and payments are prompt on open terms.

Russia pays in New York, but is said to be demanding terms of payment net New York, freight paid alongside steamer, by draft on New York bank dated 45 days after securing inspection certificate from Amtorg. Inspection is made in the manufacturer's plant.

Great Britain is our best customer; the credit situation is good and the duty is waived if there is no competitive machine of British manufacture available to do the work required. The British Import Duties Advisory Committee does not accept the claim of a British manufacturer that he makes a machine competitive to the one to be imported without careful investigation. They take into consideration the price of the British machine, the period of delivery, and the question as to whether the British machine is actually being produced.

In Japan items of 10,000 yen (about $2,000) or over are subject to approval of payment by the government. It also has an allotment which cannot be exceeded. Orders have been offered to American machine tool builders, subject to cancellation if the permit to import cannot be secured from the Japanese Government.

A factor that tends to stimulate American export sales is the long deliveries offered by English and German machine tool builders. However, this is offset to some extent by the fact that German plants give any export order precedence over any domestic order, and it is understood a government subsidy is also offered to increase such sales.

Exports of Machinery During March, 1937

	March 1937	February 1937	March 1936
Electrical machinery and apparatus	$9,325,955	$8,002,742	$7,560,909
Power generating machinery (except automotive and electric)	1,000,028	1,096,333	922,506
Construction and conveying machinery	1,365,899	1,244,848	774,957
Mining, well and pumping machinery	4,510,810	3,587,507	2,565,859
Power-driven, metal-working machinery	4,497,750	4,061,919	4,121,428
Other metal-working machinery	479,913	308,228	326,672
Textile machinery	710,537	621,263	799,543

Exports of Metal-Working Machinery During March, 1937

	March 1937	February 1937	March 1936
Engine lathes	$209,729	$146,661	$620,898
Turret lathes	332,128	200,090	108,152
Other lathes	160,026	87,274	92,702
Vertical boring mills and chucking machines	277,838	147,938	109,724
Thread cutting and automatic screw machines	208,768	204,103	251,561
Knee and column type milling machines	256,697	242,861	67,899
Other milling machines	347,361	291,384	121,458
Gear cutting machines	255,206	313,436	264,781
Vertical drilling machines	74,117	69,751	43,599
Radial drilling machines	31,624	18,685	18,537
Other drilling machines	129,253	110,790	204,543
Planers and shapers	56,667	101,840	49,111
Surface grinding machines	145,511	106,208	92,008
External cylindrical grinding machines	113,211	61,422	87,919
Internal grinding machines	191,587	176,746	110,847
Tool grinding, cutter grinding and universal grinding machines	152,439	114,621	69,665
Other metal grinding machines	68,074	131,357	90,897
Sheet and plate metal working machines	255,567	521,314	198,974
Forging machinery	326,612	62,055	195,158
Rolling mill machinery	204,952	261,205	470,039
Foundry and molding equipment	78,794	101,891	574,079
Other power-driven metal-working machinery and parts	621,589	590,287	278,877
Other Metal-Working Machinery			
Pneumatic portable tools	121,856	85,102	84,519
Other portable and hand and foot operated metal working machines and parts	98,994	87,548	76,473
Chucks for machine tools	26,329	28,112	15,147
Milling cutters, machine operated threading dies and taps and similar machine-operated metal cutting tools	178,012	55,146	87,953
Other metal-working machine tools	54,722	52,320	62,580

Technical Translations

Technical idiom about machinery is such that knowledge of a foreign language is not sufficient for perfect understanding. The Machinery Division, Bureau of Foreign and Domestic Commerce, is translating some of the literature of the american machinery manufacturers associations. The translations are distributed to purchasing agencies and prominent engineers in South American countries. One of the first pamphlets translated was one prepared by the Association of Fan Manufacturers.

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W. W. HANOLD, for 64 years an employee of Johns-Manville Corp., died recently at the age of 87.

WATCHING Washington

Whipping congressmen into line gets harder . . . War fear disappears . . . Opposition to court-packing grows . . . Amendments to Wagner Act doubtful . . F.T.C. action on like bids asked . . . Ickes wages own war

WASHINGTON—Back from his fishing vacation the President needed all his rejuvenated energy to cope with the regular spring upheaval in Congressional ranks. On the way home he reiterated his campaign speech promise that he would keep on toward Utopia via New Deal by-ways which apparently include a somewhat modified AAA and a revived NRA devoted mostly to working conditions in industry and trade. But this year the job of whipping the boys back into line promises to be tougher than before despite the lavish use that has been made of patronage. The boys on the firing line have been hearing from back home.

One big reason for the collapse of the expected Senate scrap on neutrality was the discovery that Mr. and Mrs. Main Streeter had simply lost interest. Mail to senators and representatives on the neutrality bill, on keeping the United States out of war, has dwindled to the vanishing point. The folks who do the voting, and letter writing, have gotten interested in other things. The small town newspaper editors sensed this before the Washington statesmen, and stopped writing editorials. Small town editorials form a barometer second only to direct personal mail in most Capitol Hill offices. Behind this loss of interest apparently is the conclusion, rightly or wrongly, that the danger of a world conflagration into which the U. S. might be dragged is not imminent.

War Scare Past

Still amazed at this sudden nation wide diagnosis of the war danger, senators began consulting their diplomatic friends here, knowing that they are just about the best informed group of people in the world, as every foreign office sends its shrewdest and longest eared diplomats to Washington. They found that the consensus of opinion in diplomatic Washington confirms the great loss of interest on the part of the letter writers and small town editors. "Nobody wants war yet. Nobody is ready. So the sparks won't ignite anything for a while," is the sum and substance of it.

The folks back home are also responsible for the dogged opposition to the Court-packing scheme that has grown rather than diminished in Senate circles. A lot of people saw through this clever maneuver and got mad enough to write about it. Orders to arrest a few prominent Philadelphia citizens who staged a protest meeting didn't help the Court packers a bit, nor did a bit of high handed radio censorship of Senator Wheeler out in the middle West. The chances for a complete victory for the President are considered to be poor, and even a compromise move faces major trouble.

Labor trouble throughout the country has continued as industry studies what to do under the Wagner Act and the stock market decline is attributed to this cause. Washington is not blind to the situation but the chances of amendment of the Act or passage of bills to protect business are slim. Meantime the N.L.R.B. is planning to make large use of its authority to summon to Washington those it desires to investigate. Faced with a large volume of work the board will operate to a greater extent from its headquarters rather than conduct most of its investigations in the field as heretofore.

N.L.R.B. Black List

Anyone failing to comply with any request of the board will automatically go on the Walsh-Healey black list, if a pending amendment goes through. If question is raised as to the jurisdiction of the Labor Relations Board to make any request this would not alter the situation. The name stays on the black list while the question of the right of the board to make the particular investigation is under discussion.

Investigations by the Department of Justice into the subject of identical bidding in the purchase of steel and other commodities, which originated with complaints by PWA Administrator Harold L. Ickes, have resulted in a letter from Attorney General Homer S. Cummings to the President recommending action by the Federal Trade Commission rather than criminal prosecution under the anti-trust laws. It is further recommended that the entire existing system of anti-monopoly legislation be reviewed by a special committee which would not only study the adequacy of present anti-trust statutes, but also examine the relationship between anti-monopoly policies and such subjects as patents, taxation, commerce, manufacturing, farming and labor.

Meanwhile Administrator Ickes continues to battle against identical bidding by awarding contracts to the manufacturer furthest distance from the point of delivery whenever identical bids are offered.

Trade Training Likely

Most significant thing in Washington today from the standpoint of manufacturers and contractors suffering from a shortage of skilled labor is something that probably will NOT happen. Apparently the labor union leaders have begun to worry about this shortage, and are making no move to oppose an appropriation for vocational training. The House Appropriations Committee boosted a budget estimate for vocational training from $3,000,000 to $7,241,500. This was to meet a charted program, based on the contention that machinists were growing old and youngsters needed jobs, but were not fitted to take the places made vacant by death and old age of trained men. Result of this new attitude of labor leaders is the larger appropriation may go through, despite the economy wave.

Congress is staging a mild revolt against dictatorship from the White House as this is written. It is much too soon to predict whether it will be smothered, as would seem probable, or whether it will mark the turning of the tide. The President may win his economy powers. He is pretty sure to have to compromise, if he can win at all, on the Supreme Court battle, and he is almost sure to lose on reorganization.—Carter Field, *Washington Bureau, McGraw-Hill Pub. Co.*

Index of Machine Tool Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Index of Orders: Foreign	Index of Orders: Total	3 Months' Average Index	% Foreign to Total Orders
1936 — May	95.7	23.2	118.9	116.6	19
June	106.5	22.3	128.8	124.4	17
July	104.4	45.7	150.1	132.6	30
August	96.1	31.4	127.5	135.5	24
September	82.9	35.6	118.5	132.0	30
October	105.4	31.1	136.5	127.5	23
November	110.7	36.4	147.1	134.0	25
December	205.7	52.0	257.7	180.4	20
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	18
April	232.5	50.0	282.5	219.8	18

Distribution of Orders

Average Indexes of Individual Companies Based on 1926 Level of Business	Companies in Per Cent of Total Number Reporting: 1936 1st Quar.	1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 1st Quar.	1937 April
200-up	13.0	17.2	15.8	28.4	31.6%	46.7%
100–199	24.6	32.6	28.8	30.2	32.8	26.7
60– 99	22.4	19.0	22.9	19.5	16.4	11.8
20– 59	26.5	21.8	21.7	15.2	12.2	12.6
Less than 20%	13.5	9.7	10.8	6.7	7.0	2.2

Industrial Review

• THE FLY in the industrial ointment is the labor situation which gives machinery sales a spotty complexion. Business has been good and is still good, but recessions in volume have become apparent in those localities where labor agitation has borne fruit. Quoted long deliveries are another deterring factor as some executives hesitate to make 1938 commitments, the labor and political picture being what it is. The maintenance of a large volume of orders in the face of these disturbing influences reflects the strong basic need for better equipment.

• NEW ENGLAND enjoyed fine machinery sales during April and the first half of May with no present indication of a let-up. Optimism here is high for the balance of the year. New York, while feeling the resistance of long deliveries, is aided by General Motors buying for this state. Philadelphia on the other hand has many instances of inquiries being delayed that a week ago held promise. It is felt that the vigor of buying will be tempered until some of the unfilled orders have been cleared up.

• PITTSBURGH ORDERS for May are about equal to the first four months average despite strike troubles in the steel mills. Cincinnati, too, is making an exceedingly good start in May which promises to equal the very satisfactory level maintained in April. While there are no open labor disturbances here, quiet organization is going on. Some recession is forecast in Cleveland because of C.I.O. activities.

• DETROIT ALSO looks for a falling off from the present abnormally high volume. However, new buying by the auto manufacturers and renewed activity in the tool shops are expected to keep the ball rolling. Incoming inquiries are lighter in Chicago. Here again political utterances and strikes are the retarding influences, and some concerns look for a slow summer. Milwaukee, despite disturbances, is doing well.

• ST. LOUIS finds that extended deliveries are the chief cause of trouble since the strike situation has improved. Small tool sales continue very active. Machine tool orders are good on the Pacific Coast. Statistics in this section point toward industrial improvement with many of the labor disagreements being settled by negotiation.

April Machine Tool Orders Make New High

More business than last December, which was a record month, is the report of machine tool dealers for April. An index number of 282.5 as compared to the March index of 211.6 and the December index of 257.7 indicates the continued improvement of business. A large part of the increase was due to domestic business although foreign sales show a substantial gain. It is interesting to note that in spite of its increase, foreign trade showed no change in the percentage of total business done.

That most of the companies dealing in machine tools are sharing in this upswing is indicated by the upward movement in the average indices of the companies reporting.

Plans for A.S.T.M. 40th Annual Meeting Announced

The 40th annual meeting of the American Society for Testing Materials will be opened on June 28 with the annual address by its president, A. C. Fieldner. The topic of Mr. Fieldner's address will be "Fuels of Today and Tomorrow." This convention which is being held at the Waldorf Astoria Hotel, New York, June 28-July 2, includes 19 formal sessions which will discuss such items as methods of testing, corrosion, steel and wrought-iron, fatigue and creep, paint and others.

An exhibit of testing apparatus and related equipment will be held in connection with this meeting. Some 40 companies have announced themselves as exhibitors for this event. In addition to the displays of commercial apparatus and supplies, a number of A.S.T.M. committees will sponsor exhibits of their work. This will include corrosion test exhibits, a special display of photomicrographs, radiographs and X-ray photographs and a display showing the effect of temperature on the properties of metal.

The 12th Edgar Marburg lecture will be delivered by Dr. T. Smith Taylor on "Plastics: Some Applications of the Different Classes—Methods of Testing." At this same meeting the Charles B. Dudley Medal will be presented to W. H. Swanger and G. F. Wohlgemuth, National Bureau of Standards, for their paper on "Failure of Heat-Treated Steel Wire in Cables of the Mt. Hope, Rhode Island Suspension Bridge," presented before the Society at the 1936 Annual Meeting.

Detroit LETTER

Oldsmobile announces automatic transmissions . . . Chrysler plans decentralization. . . . G.M. parts and accessories plants expand . . . Automobile costs rising . . . Tool and die shop wages agreed upon

DETROIT—Biggest news of the week is the decision of Oldsmobile to put its new automatic transmission on its current eight-cylinder models as optional equipment. Announcement of this event is to be made in Detroit on Saturday, and other local introductions will be made as cars with the unit become available. The transmissions are being built at Buick's factory in Flint at the rate of about 150 units daily, which isn't in very large volume. Buick is said to have in service around 2,000 of its own cars equipped with this transmission and the results are most satisfactory.

It will be recalled that Oldsmobile originally intended to use the new transmission at the start of the '37 season, but changed its mind last fall. Then it was rumored that it would wait until spring or possibly until the 1938 season. Detroit is speculating on why Oldsmobile is announcing the transmission at the peak of the spring selling period. There may be several reasons: (a) sales will be stimulated this summer, (b) it will give Oldsmobile a chance to see how the unit takes with the public in advance of the '38 season, and (c) Oldsmobile will get unchallenged credit for introducing a possible vogue for automatic transmissions and not have to share it with Buick.

Taking the cue from General Motors, Chrysler finally is launching a program of manufacturing decentralization. It is spending about one million dollars for gear-cutting equipment and other machinery for a transmission plant to be located at Kokomo, Ind. Chrysler is reported to have acquired the old Haynes factory there and will have the building remodeled and machinery installed in time to begin production in October. Forgings will be shipped to Kokomo from the Newcastle plant near by. The transmission to be made at Kokomo is a duplicate of that now being built at the Dodge factory in Detroit. The Kokomo factory will be operated as a Dodge division. This will give Chrysler two sources of supply inside the corporation.

Rumors of Chrysler expansion in the East persist, but are erroneous. One story unofficially denied is that Chrysler has secured land at Lockport, N. Y., and will erect a plant to make motors (Lockport is the home of the Harrison Radiator Division of General Motors and isn't far from Chevrolet's new motor and axle plant at Buffalo). Chrysler is proceeding rapidly with its program for a motor plant in Canada. Whatever buying is to be done for Detroit plants for the '38 season has been pretty well cleaned up.

The General Motors parts and accessories expansion is going ahead at full speed. Guide Lamp Division at Anderson, Ind., is erecting an addition 160x200 ft. to house the tool room and a new die casting department beginning July 1. Delco-Remy at Anderson is constructing a new factory with 144,000 sq.ft. of floor space to which the starting motors department will be moved. Packard Electric Division at Warren, Ohio, is spending $400,000 for a one-story addition, while Harrison Radiator Division at Lockport, N. Y., is erecting a large plant to expand its output of car heaters, thermostats and radiators. A new division at Rochester, N. Y., will produce air cleaners, speedometers, brakes and other car parts, increasing total production of parts now made by AC Spark Plug and Delco Divisions. Brown-Lipe-Chapin at Syracuse, N. Y., will make 2,000 steering gears a day as well as head lamps, bumper guards and hub caps for G.M. assembly plants in the East. Inland Mfg. Division at Dayton, Ohio, has not yet selected the site for its eastern plant.

Ford's small plants program is moving along rapidly. Carburetors will be made at the new Milford, Mich.,

Light Finishing—Therapeutic lamps save backtracking through big baking ovens by supplying heat intensities up to 250 F. to Plymouth bodies ordered with special stripes or color combinations. Installed near the end of the assembly line the banks of lights are mounted on flexible standards to permit focusing the heat on any part of the car body

factory. Roscoe Smith, heretofore manager of the Ypsilanti factory, has been given charge of all the small plants in southern Michigan.

Costs of making automobiles are mounting swiftly. One independent car maker reports the expense up $28 a car today as compared with three months ago. That is more than his profit per car, and costs are still rising. Truck makers—Diamond T. Federal, International—have boosted retail prices and passenger car companies will follow shortly. However, Ford still is the custodian of the car price key and can do about as he pleases with it. If he chooses to keep prices down, despite advancing costs of materials and labor, it's going to be tough for the other car makers.

Higher costs are traceable not only to increased materials and labor prices, but also to decreased production per man as against a year ago. Manufacturers are working day and night on the problem of reducing costs by installing more multiple-operation machinery. Though union officials deny any part in it, the fact is that some attempt has been made by union men in car factories to restrict the output of high-production machines by instructing the operator to refuse to work beyond a certain gait.

Sitdown strikes in local tool and die shops such as Koestlin and Richards Brothers have ended in agreements with the United Automobile Workers patterned after the Bendix contract. The minimum rate for tool and die makers has been set at $1.20 an hour, and for machine men $1.10. The average rate of tool and die makers will be $1.30 to $1.40. Many of the smaller jobbing shops have signed up, and their rates now are said to be higher than those prevailing in captive shops. The U.A.W. is reported carrying its organizational drive among tool and die shops into Salem, Ohio, and other cities outside Michigan.

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R. C. Bullard, advertising and publicity manager, was elected to the board of directors, The Bullard Co., Bridgeport, Conn.

R. F. V. Stanton is now agency sales manager, Pratt & Whitney division, Niles-Bement-Pond Co.

O. W. Young is now general manufacturing manager, Buick division, General Motors Corp. He succeeds the late Charles Scannell. Walter N. Larke was named assistant to J. G. Hammond, general superintendent. Fred W. Letts becomes superintendent of the engine plant and R. W. Warnock, superintendent of special transmissions.

Gear Manufacturer

JOHN CHRISTENSEN

John Christensen, Gear Manufacturer, Dies

John Christensen, president, Cincinati Gear Co., died of a heart attack in his cabin aboard the liner Pilsudski as it arrived in London, May 11, for the coronation. He was 67 years of age.

Mr. Christensen was one of the founders of the American Gear Manufacturers' Association some 21 years ago and served as its president in 1934. Together with Soren Sorensen he started his own business in machine shop equipment in 1907.

For nearly 20 years Mr. Christensen had been president of the Danish Brotherhood of America and ten years ago he was knighted by King Christian of Denmark.

Machinery Groups Install Officers at Convention

New officers were installed at a triple convention of machinery suppliers and manufacturers' associations at Memphis, Tenn., on May 13.

The American Supply & Machinery Manufacturers' Association, Inc., elected and installed the following officers: Roger Tewksbury, Oster Mfg. Co., president; W. A. Purtell, Holo-Krome Screw Corp., first vice-president; Herbert Ladds, Lamson & Sessions Bolt Co., second vice-president; E. S. Grant, Dodge Mfg. Co., treasurer; and R. Kennedy Hanson, Pittsburgh, secretary-manager. Executive committee is D. W. Northup, Henry G. Thompson & Son Co.; H. K. Clark, Norton Co.; C. O. Grayton, Graton & Knight Co.; R. G. Thompson, Lufkin Rule Co.; and Thomas Robins, Jr., Hewitt Rubber Corp.

Russell C. Duncan, R. C. Duncan Co., was elected president of the National Supply & Machinery Distributors' Association. Others elected were W. T. Ryan, Cutter, Wood & Sanderson Co., first vice-president; C. E. Curtis, Western Iron Stoves Co., second vice-president; George Fernley, Philadelphia, advisory secretary; and H. R. Rinehart, secretary.

The Southern Supply & Machinery Distributors' Association, Inc., elected Robert S. Page, Henry Walke Co., president; Jack B. Dale, Briggs-Weaver Machinery Co., first vice-president; Edward F. Strauss, Oliver H. Van Horn Co., Inc., second vice-president; and Alvin M. Smith, Smith-Courtney Co., secretary-treasurer. C. A. Dillon, retiring president, Raleigh, N. C., was made chairman of the executive committee of which F. M. Archer, Bluefield, W. Va.; J. Crimmins, Chattanooga; and J. M. Bates, Birmingham, are the other members.

Foreign Tariff Summary

Export benefits derived from Secretary Hull's reciprocal trade agreements are summarized and classified according to products in a recent report of the Department of Commerce, Bureau of Foreign and Domestic Commerce. Copies may be secured from Washington or any of the district offices.

Meister Appointed Hyatt Roller Bearing Manager

The appointment of H. O. K. Meister as general manager, Hyatt Bearings Division, General Motors Corp., Harrison, New Jersey has been announced by William S. Knudsen. Mr. Meister has been employed in various capacities in the company since 1914. Since 1929 he has been assistant general manager.

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R. M. CARTER has been elected president of the H. A. Smith Machinery Co., Erie Boulevard E. and South Townsend Sts., Syracuse, N. Y. He was formerly with the Gisholt Machine Co., Madison, Wis.

National Broach & Machine Co., Detroit, announce the addition appointment of L. B. ALLIASON as sales engineer. Mr. Alliason was formerly with the Ford Motor Co., and the Gear Shaper Co.

The Billings & Spencer Co., Hartford, Conn., announce the appointment of KENNETH B. KOMP as direct representative in Michigan and Ohio.

Manufacturing Industries Employ More Than in 1929

The National Industrial Conference Board reports that in the 25 major manufacturing industries employment in March was 0.5 per cent higher than it was in 1929. The growth of the past year has been particularly marked, the average number of wage earners employed in March, 1937, being 17.3 per cent higher than the average number in March, 1936.

Actual weekly earnings averaged $27.49 in March which was 3.7 per cent lower than the 1929 average of $28.55. Since the cost of living in March, however, was 12.2 per cent lower than in 1929, real weekly earnings were 9.6 per cent above the 1929 level.

In March, 1937 the work week in manufacturing industries averaged 41.7 hours. This was 13.7 per cent less than in 1929 when the average was 48.3 hours.

Tokyo University Faculty Questions Machine Qualities

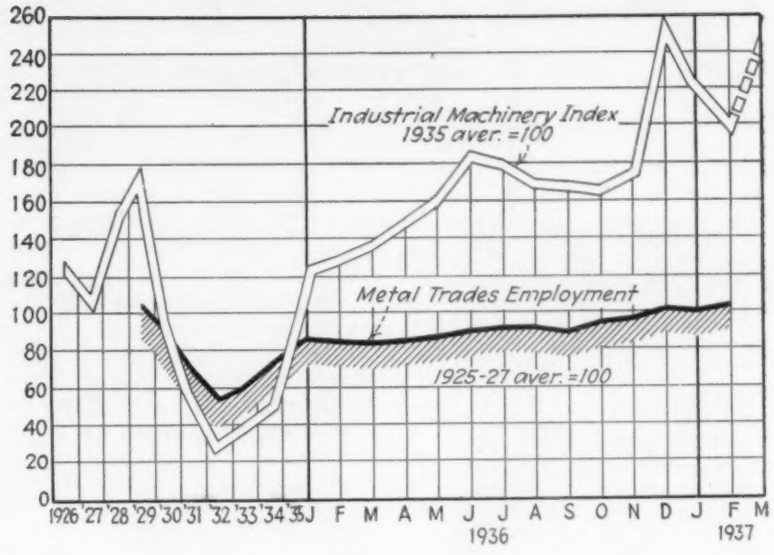
Tokyo—The quality of Japanese machine tools was seriously question in a round-table discussion by members of the engineering faculty of the Tokyo Imperial University reported in the magazine, "Ekonmisuto" (Economist).

Dr. Yamada states, "There is no denying that Japan still lags behind other engineering countries in some materials, especially in the quality of special steels."

"The same is true in the case of ball bearings," writes Dr. Ebihara, assistant professor and research member of the Institute for Physical and Chemical Research.

"There is no doubt that Japanese machine tools are inferior to leading foreign makes, and that some local makers continue to produce antiquated designs."

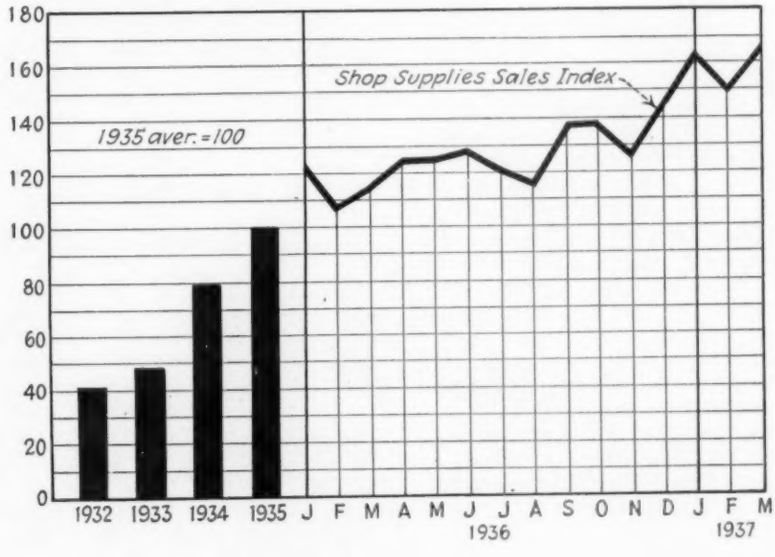
Dr. Yamamoto indicated that one of the causes for poor quality is the fact that Japanese makers depend entirely on local buyers, and their output and market is so limited that it does not pay them to maintain a large research laboratory for the benefit of the industry. He says, "It is impossible to produce highly dependable machines unless long and continuous research is carried out at a great expense, which can only be raised by marketing the product throughout the world."



Industrial Machinery Index Rose in March

If we may judge from the 47-point rise in the index of machinery orders for March, the market has absorbed the reaction following the abnormal December peak and is again on the upgrade. Certainly the index was at a high level in March because the preliminary figure for that month is only 10 points below the December peak.

Against the Machinery Index we are plotting the Labor Barometer of the National Metal Trades Association. Note that this curve is plotted on a 1925-27 average base instead of the 1935 base used for the other curve.



Shop Supply Sales Index Reaches New High

Reversing the downward trend of February, March sales of shop supplies moved up to a new high of 167.7. Compare this figure with that for March of last year—115.

General Motors Elects New Officers and Adopts New Policies

William S. Knudsen made president; will be in charge of operating divisions and will also serve on policy committee

WILLIAM S. KNUDSEN

General Motors Corp. directors made sweeping changes in the organization of its high executive personnel which included the elevation of Alfred P. Sloan to chairman of the board and William S. Knudsen to president. Marvin E. Coyle, general manager, Chevrolet Motor Division, and Floyd O. Tanner, who will deal with labor relations, were elected vice-presidents.

With the change in officers, a change in method of management was made by abolishing the finance committee and the executive committee on the basis that the broader problems of management divide themselves into two groups: one involving policy, and the second, administration of policy. Committees were established to head these groups, a policy and an administration committee. Mr. Sloan is chairman of both.

In view of the enlarged operating responsibilities now attached to the chairmanship of the board, Lammot duPont had declined re-election. Donaldson Brown was elected vice-chairman of the board. Mr. Knudsen, as president of the corporation, will assume complete responsibility as to administration of all the corporation's operating divisions and subsidiaries other than those of a strictly financial nature.

The following were elected to the policy committee: Donaldson Brown, Albert Bradley, Walter S. Carpenter, Jr., Lammot duPont, William S. Knudsen, Alfred P. Sloan, Jr., John Thomas Smith, George Whitney and C. E. Wilson. The administration committee is composed of Albert Bradley, Lawrence P. Fisher, R. H. Grant, O. E. Hunt, William S. Knudsen, James D. Mooney, C. E. Wilson, R. K. Evans, F. O. Taner and Alfred P. Sloan, Jr.

American Iron & Steel Institute Elects Officers

Hayward Niedringhaus, president, Granite City Steel Co., Granite City, Ill., Robert W. Wolcott, president, Lincoln Steel Co., Coatesville, Pa., and C. S. Stone, president Atlantic Steel Co., Atlanta, Ga., are newly elected directors of the American Iron & Steel Institute, New York.

Directors reelected for a three-year term were H. G. Dalton, chairman, Youngstown Sheet & Tube Co., Cleveland, B. F. Fairless, president, Carnegie Illinois Steel Corp., Pittsburgh; W. W. Holloway, president, Wheeling Steel Corp., Wheeling, W. Va.; Frank Purnell, president, Youngstown Sheet & Tube Co., Youngstown, Ohio; E. L. Parker, president, Columbia Steel & Shafting Co., Pittsburgh; and W. F. Detwiler, president, Allegheny Steel Co., Brackenridge, Pa.

W. J. Cameron Addresses Machine Tool Builders

W. J. Cameron, Ford Motor Company, speaking at the annual banquet of the National Machine Tool Builders Association, told members that industry is constantly working to breed out the old evils in trade and employment and to breed in new social values. "To my knowledge," said Mr. Cameron, "there have never been any social improvements in industry from outside force or pressure. No social advances have ever originated with any government, labor leaders or any reform movement outside industry. They have all come from inside development of progressive and enlightened industry. Of course, I do not claim that all industry is progressive and enlightened for if there were not so much stupid management, there would not be so much labor trouble.

"But it is plain to see that all the desirable things which have been fought for in strikes have always been those things which were first created and set up by forward-looking industry. Otherwise the labor forces would not know about the desirable conditions. Nobody ever demands anything they don't know about."

Mr. Cameron told his audience that the evils which are complained of in industry today have always existed and are positively detrimental to industry for they foster waste, dissension and disorganization.

"For this reason," he said, "the steady trend of industry today is to breed out these undesirable blemishes and to supersede them with social benefits which have been conceived, tested, demonstrated and established by industry."

PERSONALS

F. B. HUFNAGEL was elected chairman, Crucible Steel Co. of America, succeeding H. S. WILKINSON, deceased. Mr. Hufnagel retains his office of president.

R. G. ADAIR, formerly assistant to the works manager, Butler, Pa., plant of the American Rolling Mill Co., has been named assistant director of industrial and public relations with headquarters at Middletown, Ohio.

A. H. BRANDEL has been appointed assistant manager of manufacturing of the Oldsmobile division of General Motors Corp. He has been associated with Oldsmobile for 28 years, and has been general superintendent since 1930. He succeeds GREY BERNARD, resigned.

W. HERBERT BRETZLAFF has been named vice-president, Defiance Pressed Steel Co., Marion, Ohio. He was formerly vice-president in charge of national account sales for E. A. Laboratories.

DANIEL T. HADDOCK was elected president of the newly organized Ohio Sheet & Tin Plate Corp., Marietta, Ohio. G. RAYMOND STEEN was named vice-president and LEONARD HARPER, secretary and treasurer. Operations of the new plant are scheduled to begin approximately June 15.

THEODORE S. SEE, formerly works manager, LaSalle Steel Co., Chicago, has been elected vice-president in charge of operations.

Promoted by Pontiac

ROBERT H. AHLERS

ROBERT H. AHLERS, formerly general manager of the Delco Brake division of General Motors, Dayton, Ohio, has been made assistant general plant manager of the Pontiac Motor division of General Motors Corp.

RALPH R. JENKINS will act as assistant to JAMES M. HILL, president and general manager, Empire Sheet & Tin Plate Co., Mansfield, Ohio. He has been associated with the company for approximately ten years in various capacities. WILLIAM LAKE has been made general superintendent of all plants.

W. T. HUGUS is now superintendent, American Works, Carnegie-Illinois Steel Corp., Elwood, Ind.

OBITUARIES

CHARLES F. BOYNTON, a member of the executive staff of the New York office, National Electrical Manufacturers Association, died May 1 at the age of 62. He had been connected with the association since 1933.

CHARLES N. TEETOR, president, Perfect Circle Co., Hagerstown, Ind., died May 2, at the age of 66 years. In 1916 he began the manufacture of piston rings under the name of the Indiana Piston Ring Co., later changed to Perfect Circle Co.

CHARLES T. SCANNELL, general manufacturing manager, Buick division, General Motors Corp., died May 2 at the age of 54. He had been connected with Buick since 1906. For ten years he was in charge of the manufacture of engines, and for the last three years has been responsible for all of Buick's production.

ALBERT L. SESSIONS, president, J. H. Sessions & Sons, trunk hardware manufacturers, Bristol, Conn., died April 29 at the age of 65. Mr. Sessions succeeded his father in the business in 1902 and incorporated the company in 1905. Two sons survive, PAUL B., vice-president, and JOHN H. SESSIONS, 3rd.

ADRIAN P. WOLFF, 83, former mechanical superintendent and consulting engineer for the Scoville Mfg. Co., Waterbury, Conn., died recently. He retired from active work in 1933 after being associated with the company for 65 years.

BUSINESS ITEMS

The Century Electric Co., announces that it has moved its New York offices to 30 Vesey St.

Crellin Machine Co., screw machine products, Los Angeles, is adding a new building to its factory at 117-123 Llewellyn St.

The A. & G. Machine Works, conveying, elevating and transmission equipment, has moved its plant to 1937 Santa Fe Ave., Los Angeles.

The Rite-Way Tool & Die Corp., 1931 Martindale Ave., Indianapolis, has been formed to manufacture tools, dies and machinery. Incorporators are CHARLES S. HENSON, HERBERT S. WRIGHT and ROBERT CAUDELL.

Superior Mfg. Co., Inc., 215 E. Berry St., Alexandria, Ind., has been organized to manufacture automatic coal stokers and insulation blowing machines. Incorporators are NOEL P. IRWIN, MILDRED IRWIN and RAYMOND MCCARTY.

Cincinnati Milling Machine and Cincinnati Grinders, Inc., announce the appointment of E. M. LEVINE as sales engineer in the Pittsburgh District Sales Office.

Ford Motor Company, Canada, is to build a new assembly plant on Kingsway, between Vancouver and New Westminster, B. C. $500,000 is to be spent for equipment. A floor space of 76,800 sq.ft. is to be provided by a new one-story structure.

Norton Co., Worcester, Mass., is providing a new building for the wheel finishing department which will have an area of 30,000 sq.ft. at an estimated cost of $200,000.

Pollard Bros. Mfg. Co., steel factory equipment, has moved to larger quarters at 5504-8 Northwest Highway, Chicago.

Scovill Mfg. Co., Waterbury, Conn., is adding approximately 16,000 sq.ft. to its floor space with an estimated cost of over $100,000 with equipment.

Consolidated Machine Tool Co. of America, Inc., Rochester, N. Y. has let a contract for a one story and basement addition, 150 x 200 ft., with an estimated cost of over $80,000 with equipment. Improvements at the company's branch plant at Albany will cost approximately $50,000 with equipment.

Joy Manufacturing Co., loading machines, conveyors, and other mechanical handling equipment, Franklin, Pa., is planning a one-story addition to cost about $45,000 with equipment.

Liberty Machine Works, machinery and parts manufacturer, St. Louis, plans an 8,000 sq. ft. addition to cost approximately $45,000 with equipment.

American Steel Foundry resumed operations at its Verona Works, Verona, Pa., on May 7. It is expected to employ approximately 400 men. The increase in railway business in which the company specializes caused the reopening of the plant after an eight-year shut-down.

Baldwin-Duckworth Chain Corp., Springfield, Mass., has appointed Olmsted-Flint Corp., Main & Portland Sts., Cambridge, Mass., to act as its Boston distributor.

MEETINGS

AMERICAN ELECTRO-PLATERS' SOCIETY. Twenty-fifth Annual Convention. June 14-17. Hotel Pennsylvania, New York. HENRY A. PAINTER, secretary, Berkley Blvd., Iselin, N. J.

AMERICAN GEAR MANUFACTURERS ASSOCIATION. 21st Annual meeting, Galen Hall Hotel, Wernersville, Pa. May 24-25. J. C. MCQUISTON, manager-secretary, Penn Lincoln Hotel, Wilkinsburg, Pa.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Summer Convention. Milwaukee, Wis. June 21-25. H. H. HENLINE, secretary, 33 West 39th St., New York, N. Y.

AMERICAN SOCIETY OF MECHANI-

CAL ENGINEERS. Semi-annual meeting. May 17-21. Statler Hotel, Detroit. C. E. DAVIES, secretary, 29 W. 39th St., New York.

AMERICAN SOCIETY FOR TESTING MATERIALS. Annual meeting and exhibit of testing apparatus and related equipment. Waldorf-Astoria Hotel, New York. June 28-July 2. R. E. HESS, assistant secretary, 260 So. Broad St., Philadelphia.

ASSOCIATION OF AMERICAN RAILROADS, MECHANICAL DIVISION. Annual meeting, Municipal Auditorium, Atlantic City. June 16-23.

ASSOCIATION OF MACHINE TOOL DEALERS. Annual Convention, Skytop, Pa. June 14-15. JOHN SAUER, JR., Peninsular Machinery Co., 2921 E. Grand Blvd., Detroit, Secretary.

ECONOMICS CONFERENCE FOR ENGINEERS. Seventh Annual Convention. Stevens Engineering Camp, Johnsonburg, Warren County, N. J. June 18-26. PRESIDENT HARVEY N. DAVIS, Stevens Institute of Technology, Hoboken, N. J.

NATIONAL METAL TRADES ASSOCIATION. 39th Annual Convention. Palmer House Hotel, Chicago. May 27-28. HARRY S. FLYNN, secretary, Peoples' Gas Building, Chicago, Ill.

RAILWAY SUPPLY MANUFACTURERS ASSOCIATION. Exhibit and meeting in connection with Association of American Railroads, Mechanical Division. Municipal Auditorium, Atlantic City. June 16-23. J. D. CONWAY, secretary-treasurer, 1941 Oliver Bldg., Pittsburgh, Pa.

EXPORT OPPORTUNITIES

* Interested American firms and individuals may obtain the names and addresses of the foreign firms making these inquiries upon application to the Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, Washington, or any district or cooperative office. Please refer to key number.

Chemical and pharmaceutical plant equipment. (Purchase and Agency). Brussels, Belgium. *3123.

Die-casting machinery to produce dies of zinc base or aluminum alloy. (Purchase). Birmingham, England. *3131.

Electric cable insulating machinery. (Purchase and Agency). Brussels, Belgium. *3123.

Engine, Diesel, stationery. (Purchase). Montreal, Canada. *3099.

Extractors, orange juice, of large capacity. (Purchase). Rio de Janeiro, Brazil. *3124.

Machinery, industrial. (Agency). Marseille, France. *3114.

Rubber goods machinery. (Purchase and Agency). Brussels, Belgium. *3123.

Tool-manufacturing machinery, for making shovels, spades, pickaxes, hammer heads, forks, and hoes. (Purchase). London, England. 3107.

Zinc dry cell manufacturing machinery. (Purchase). Hermosillo, Mexico. 3089.

PATENTS

April 27, 1937

Machines

Semiautomatic Electroplating Machine. Albert H. Hannon, Springfield, Ohio. Patent 2,078,381.

Cam Grinding Machine. Herbert A. Silven, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,078,462; 2,078,463.

Die Casting Machine. Vladimir J. Sebek, Cicero, Ill. Patent 2,078,611.

Rivet Setting Machine. Julius Gaultiere, Brooklyn, N. Y., assigned to Edwin B. Stimpson Co., Brooklyn. Patent 2,078,660.

Automatic Lathe and Fluid Circuit. Ernest J. Svenson, Rockford, Ill. Patent 2,078,695.

Automatic Lathe. Ernest J. Svenson, Rockford, Ill. Patent 2,078,695.

Roll Grinding Machine. Albert G. Belden, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,078,705.

Hydraulically Operated Grinding Machine. Wallace H. Wood, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,078,749.

Spring Machinery. Charles H. Baer and Herschel M. Connor, San Francisco, assigned to Connor Spring Mfg. Co., San Francisco. Patent 2,078,828.

Parts and Mechanisms

Variable Speed Transmission and Two Speed Planetary Gear. Ernst Siebold, Heidenheim-on-the-Brenz, Germany, assigned to J. M. Voith, Heidenheim a.d. Brenz. Patent 2,078,287.

Clinch-On Nut. Frederick G. Richardson, Detroit, assigned to F. L. McLaughlin Company, Detroit. Patent 2,078,411.

Rivet Feed. (Hollow Rivets). Julius Gualtiere, Brooklyn, N. Y., assigned to Edwin B. Stimpson Co., Brooklyn. Patent 2,078,659.

Automatic Feeding Mechanism. William E. Smith, Detroit, assigned to The Midland Steel Products Co., Cleveland. Patent 2,078,694.

Hydraulic Material Working Apparatus. Ernest J. Svenson, Rockford, Ill. Patent 2,078,696.

Material Working Apparatus and Hydraulic System of Control Therefor. Ernest J. Svenson, Rockford, Ill. Patent 2,078,698.

Grinding Machine Table Reciprocating Mechanism. Carl G. Flygare, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,078,757.

Variable Control Mechanism. Charles Walker, Knoxville, Tenn. Patent 2,078,821.

Variable Transmission Mechanism Charles Walker, Knoxville, Tenn. Patent 2,078,822.

Mounting for a High Speed Cutting Tool. De Forest A. Lapham, Syracuse, N. Y. Patent 2,078,859.

Machine Tool (Reciprocating Table). Otto Panzner, Chemnitz, Germany, assigned to Wanderer-Werke vorm. Winklhofer & Jaenicke Akt.-Ges., Schonau-Chemnitz, Germany. Patent 2,078,871.

Processes

Method of Annealing. Lee Wilson, Cleveland, Ohio. Patent 2,078,356.

Method of Making Nut Blanks. Joseph William Gibney, Port Chester, N. Y., assigned to Russell, Burdsall & Ward Bolt & Nut Co., Port Chester. Patent 2,078,658.

Tools and Accessories

High Pressure Lubricator. John C. Morrow, Chicago, Ill., assigned to Morrow Lubricator Co., Chicago, Ill. Patent 2,078,267.

Drill Sharpener. Roderick O. Baalmann, St. Louis, Mo. Patent 2,078,306.

Measuring Instrument (Linear). Kenneth Edward Summers, Old Fletton, Peterborough, England. Patent 2,078,352.

Grinding Apparatus (For Annular Pieces). Louis J. Sauer, Chicago, Ill. Patent 2,078,416.

Tool Holder. Sebastian J. Welter, Chicago, assigned to Armstrong Bros. Tool Co., Chicago. Patent 2,078,475.

Steadyrest for Grinding Machines. Albert G. Belden, Worcester, Mass., assigned to Norton Co., Worcester. Patent 2,078,556.

Shears for Cutting Sheet Metal. Frederic H. Rauh, South Orange, N. J., assigned to J. Wiss & Sons Co., Newark, N. J. Patent 2,078,585.

Locking Device (Tools). Gideon R. Gagne, Kenosha, Wis., assigned to Snap-On Tools Inc., Kenosha. Patent 2,078,631.

Broach. Carl J. Halborg, Detroit, assigned to Colonial Broach Co., Michigan. Patent 2,078,632.

Punch Press Mechanism. Vitus A. Boker, Minneapolis, Minn. Patent 2,078,706.

Tool Holder. Albert Viehweger, Berlin, Germany, assigned to Komet Stahlhalter- und Werkzeugfabrik Robert Breuning, Berlin. Patent 2,078,820.

May 4, 1937

Machines

Pipeworking Machine. Robert B. Pealer, Warren, Ohio, assigned to Beaver Pipe Tools, Inc., Warren. Patent 2,079,179.

Pipe Cutting Machine. Robert B. Pealer, Warren, Ohio, assigned to Beaver Pipe Tools, Inc., Warren. Patent 2,079,180.

Machine for Reaming and Beveling Pipe. Robert B. Pealer, Warren, Ohio, assigned to Beaver Pipe Tools, Inc., Warren. Patent 2,079,181.

Tapping Machine. George W. Emrick, Brooklyn, N. Y. Patent 2,079,371; 2,079,372.

Power Press. Alexander W. Fraser, Hamilton, Ontario, Canada, assigned to National Steel Car Corp., Ltd., Hamilton. Patent 2,079,553.

Parts and Mechanisms

Method of and Apparatus for Electric Welding (Tubing.) Courtney N. Mitchell, Cleveland Heights, Ohio. Patent 2,078,964.

Cross Feed Mechanism for Grinding Machines. Walter A. Gigger, Providence, R. I., assigned to Brown & Sharpe Mfg. Co., Rhode Island. Patent 2,079,007.

Work Holder for Machining Operations. Aleksa B. Kokotiak, Chicago, Ill. Patent 2,079,323.

Processes

Method of Making Cap-Screws. Henry E. Warren, Lancaster, Pa., assigned to Mac-It-Parts Co., Lancaster. Patent 2,079,056.

Method and Apparatus for Annealing. Ralph M. Parsons, Mount Vernon, Ohio, assigned to The Ralph M. Parsons Co., Mount Vernon. Patent 2,079,334.

Continuous Annealing Process. Christian Dantsizen, Schenectady, N. Y., assigned to General Electric Co., New York. Patent 2,079,494.

Tools and Accessories

Tool Retainer. Donald V. Clerk, Detroit, Mich. Patent 2,078,924.

Lifting Truck. Jakob Loef, Moosburg, Germany. Patent 2,079,078.

Sanding Machine. Frans O. Albertson, Sioux City, Iowa, assigned to Albertson & Co., Inc., Sioux City. Patent 2,079,143.

Starter-Steel Guide for Air Drilling Tools. Jesse J. Simpson, and Delbert Simpson, Jackson, Calif. Patent 2,079,189.

Marking Tool. Frederick W. Zipf, Newark, N. J. Patent 2,079,236.

Compressing Tool. Harry A. Douglas, Bronson, Mich. Patent 2,079,498.

Labor Supply and Apprenticeship

WARNER SEELY
Secretary, The Warner & Swasey Company

IN TAKING inventory of the situation now confronting industry—a critical shortage of skilled men while 8,570,000 are unemployed—it becomes apparent that something is out of kilter in our way of doing things. We have in the United States a labor force now estimated at 52,722,000 individuals. Of these, 4,434,000 are newcomers—young men who have entered the nation's labor pool since 1919. These constitute almost 9 per cent of the total number available, yet only the rare and privileged of them have had any opportunity for the training which comes through sustained employment.

No one can say how many men could be absorbed in industry if all those younger unemployed were men of skill, but it is safe to say that if the machine tool industry alone had men enough to keep up with a rising volume of business—enough so that they could deliver machines within a month or two of purchase—instead of falling farther and farther behind—the new machines would hasten reemployment up and down the line in customers' plants.

The fact is that by abandoning training programs in the face of depression difficulties and by failing to take advantage of skilled men, who for several years were available for training purposes, industry erected real barriers to its own immediate recovery. When we realize that five per cent of our skilled workers must be retired or die off each year, the necessity of avoiding recurrence of these conditions is apparent. The question is what to do about it, for it is not possible to avoid the problem.

The men best suited to do a training job are today working overtime on our production lines. They are in greater demand now than ever in our history. Today, with millions out of work, the shortage of skilled workmen forms a bottle neck that closes just so much tighter for each highly skilled man removed from the production line.

Although millions of tax funds have been poured annually into trade training, guidance, and placement—effective education and intelligent service have been the exception rather than the rule. The men in industry and not the public administrators and tax spenders, however, are to blame. If industry failed to point out the changing employment requirements in their respective fields, certainly educators and occupational theorists could not be expected to divine such trends.

I am convinced that if we do a real job of apprentice training in industry, the public agencies will rally to our support with an adequate and well-informed system for occupational counsel and guidance because of being able to secure a measurement of industry's needs. Then, and then only, can we expect pre-occupational training and education specifically designed to meet the needs of industry.

The only way to be sure that shop-training activities will survive the ups and downs of business without expulsion at the hands of management engineers when they go gunning for non-essential extras, is by placing our training on a factual engineering basis and integrating it with regular production. If we do this our training can be carried forward at minimum expense. It can be measured

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and identified to facilitate adjustment of each individual apprentice to and through all of the progressive levels of shop training.

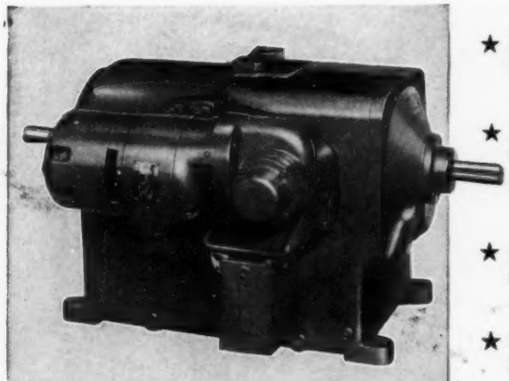
To do this, it is up to management to develop and establish definite techniques for incorporating and for measuring the results of apprentice training into existing systems of shop production. When this has been done, and only then, will industry be able to show the high school and trade school how their programs should mesh with the wheels of actual production enterprise.

If we are to complain of money squandered without practical results, we must be prepared to answer with constructive plans. What are the elements of such a program?

First of all, industry acting in unison must establish its own training facilities through industry-wide and community-wide cooperation; setting standards of training and definite measurements for progress. Next, industry must establish direct relationship with every functioning public agency from State and Federal bureaus to local high and trade schools. These contacts, if based upon a genuine spirit of cooperation, will find the public administrators eager for the counsel and guidance of industry. Finally, with standards agreed upon and potential employment needs forecasted on a scientific basis, pre-occupational training and guidance in tune with the actual needs of industry should be developed under the leadership of industry.

In these days when federal, state and local governments are taxing undistributed earnings as well as fixed assets, investments in trained personnel are in a class beyond the tax collector's reach. Dollars invested in apprenticeship training develop men who are just as valuable an asset when the need for them arises as cash in bank or the highest credit rating.

Abstracted from talk delivered before the Labor Relations Group, National Industrial Council, New York.



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Plea for Publications

GILBERT G. COOMBS

IN HIS ARTICLE under the above title (*AM*—Vol. 81, page 124), T. Gunthrop uncovers a pertinent problem, but the practicability of his suggested solution is questionable. Trade publications and catalogs are sales literature and manufacturers can hardly be expected to dispense them, even at cost, to quarters from which the predeterminable return is zero.

Mail advertising is practiced today on a tremendous scale, in fact it probably passes the line of demarcation between efficient advertising and waste. Certainly the average executive receives more advertising literature than he can intelligently digest, with the result that a great deal of it is consigned to the waste basket. It would appear that the solution of the problem under discussion lies in diverting that waste to useful channels.

The writer has made a practice of referring all trade publications to assistant foremen of the departments for perusal, and unless designated for return to the files, such literature is afterward destroyed. Inspired by Mr. Gunthrop's article, a new system will go into effect which will enable all department employees who are interested to benefit by such publications. It will not be difficult to select such employees, and a routing slip attached to the advertising matter will insure receipt by each individual.

The success of this procedure will depend largely upon the judgment of the department head in selecting for the men in the shop only such literature as will prove interesting and appreciable. A flood of uninteresting material would obviously tend to decrease interest in the scheme.

What Motor to Apply

A. W. FORBES
Forbes & Myers

THERE ARE objections to using a motor which is too large for the normal load on the machine, as has been mentioned by several writers (*AM*—Vol. 81, pages 7 and 233). The larger motor requires more current to operate, requires heavier wiring throughout the shop and often causes a low power factor. This may result in a penalty charge by the power company.

It is essential that the motor be large enough to carry the peak load, even though this peak load may occur but a few times a year. Motors three times the capacity required for average conditions may be necessary for individual drives; with group drives the extra capacity needed may be nearly as great.

One simple solution to this problem, well known to electrical engineers, has not been applied so far as I know. This is the use of motors having two or more capacities. The familiar star-delta connection, sometimes used for starting motors, can be used for continuous service, giving one rating three times the other.

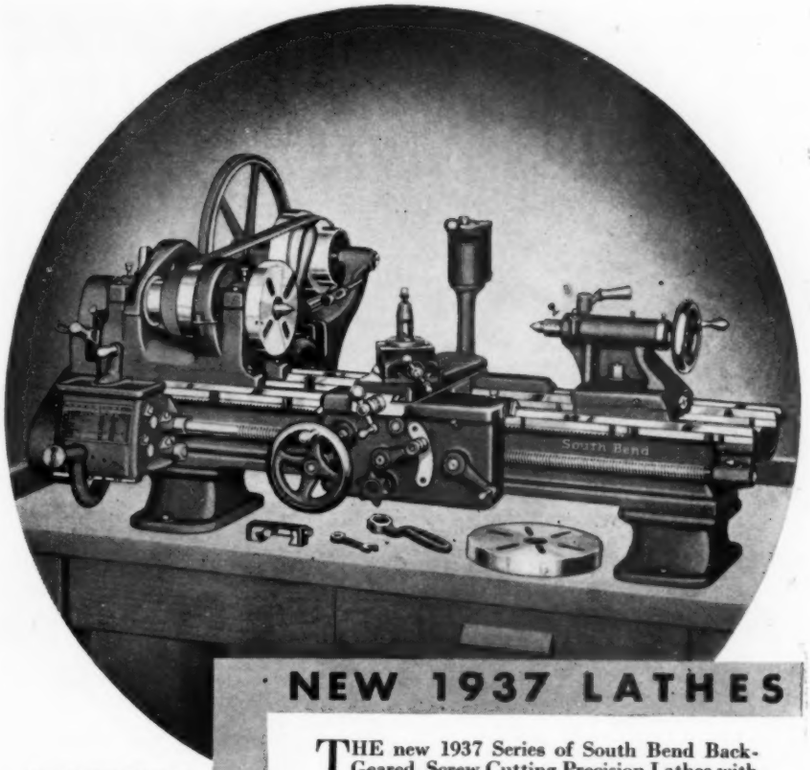
Other simple connections within the motor will give ratios between the two capacities of two to one, or nearly any other desired ratio. With such a motor, the operator could throw on the 5-hp. switch for normal operation. Then, when an extra hard job comes along he can move the switch to the 10- or 15-hp. position.

The motor would cost the same, or but a little more than a standard motor, and each rating would have all of the advantages of a standard motor of that rating. I cannot imagine why this plan has never been used. Possibly it is because the arrangement is so old that no patents can be obtained and, consequently, no one has any interest in pushing it. Perhaps, on the other hand, it may be that the operator would always use the high power rating whether it was needed or not.

There are other jobs where a motor with two ratings are needed, but where the solution is not quite so simple. Momentary peak loads, that come on suddenly without giving the operator time to throw the switch, are difficult to handle. Such an application requires an automatic relay to switch from one winding to another. When the switch manufacturers make available a moderately priced, reliable relay for this application they can be used with motors already on the market. There is an open field for such a relay wherever otherwise necessary over-size motors are causing power-factor complaints.

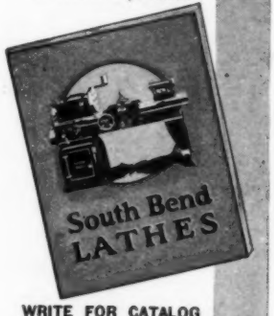
Sterilization of Goggles

GOGGLES, after having been worn by an employee, should be sterilized before reissue to another employee. Goggles used by one person continuously should also be sterilized at regular intervals. Prior to sterilization, the goggles should be scrubbed with soap and hot water. It is recommended that the work of sterilizing goggles be done by a person who thoroughly understands the procedure



NEW 1937 LATHES

No. 409YN 9" x 3' Quick Change Gear Horisontal Motor Drive Bench Lathe as shown. Wt. 471 lbs.....$345.00



WRITE FOR CATALOG No. 96 showing new 1937 Model Lathes. Sent free, postpaid.

THE new 1937 Series of South Bend Back-Geared, Screw Cutting Precision Lathes with Double Wall Aprons and hardened and ground headstock spindles are recommended for the finest and most accurate work in the tool room, machine shop, manufacturing plant, and laboratory. Offered in sizes from 9" to 16" swing, in bed lengths from 3' to 12', Underneath Belt Motor Drive, Countershaft Drive, Pedestal Motor Drive and Horizontal Motor Drive. Stocks of most sizes carried in all principal cities.

Some South Bend Lathe Stores in the U. S.

C. B. Burns Mchry. Co., 541 W. Wash. Blvd., Chicago, Ill.
A. C. Colby Mchry. Co., 183 Centre St., New York, N. Y.
Reynolds Mchry. Co., 171 Pine St., Providence, R. I.
Lee Mchry. Co., 6318 E. Jefferson Blvd., Detroit, Mich.
Voell Mchry. Co., 1533 No. 16th St., Milwaukee, Wisc.
Colcord-Wright Mchry. Co., 1223 No. Brdwy. St. Louis.
Reynolds Mchry. Co., 2034 East 22nd St., Cleveland, O.
The MacKenzie Mchry. Co., 36 Oliver St., Boston, Mass.
W. B. Rapp Mchry., 132 No. Third St., Philadelphia, Pa.

SOUTH BEND LATHE WORKS
228 East Madison Street
South Bend, Indiana, U. S. A.

SOUTH BEND *Precision* LATHES
MODERN LATHES FOR MODERN INDUSTRY

to be followed. Methods of sterilization recommended are:

A. Immersion in boiling water for a period of 5 min.

B. Immersion in live steam for a period of not less than 5 min.

C. Immersion for 10 min. in a solution of formalin made by taking one part of 40 per cent formaldehyde solution in 9 parts of water. If it is known that certain parts of the goggles will deteriorate if subjected to the above treatment, the following substitute procedures may be used:

D. Sterilization by a moist atmosphere of antiseptic gas, preferably formaldehyde, for a period of 10 min. at room temperature. Some companies sterilize goggles by scrubbing with boiling water and liquid soap, or they may be sterilized with ultraviolet light.

Abstracted from "Goggles", Safe Practices Pamphlet No. 14, published by National Safety Council, Inc., Chicago.

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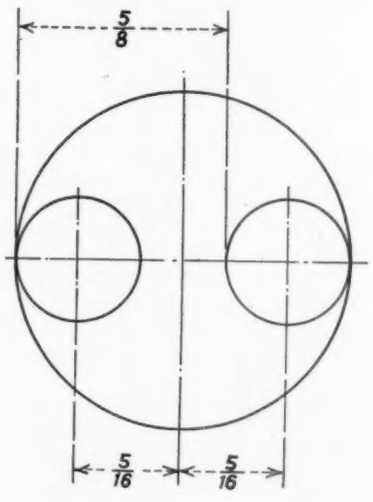
Emergency Jobs

SOME idea of the jobs that come into a small shop may be had from a recent chat with an old pioneer of a Florida shop in the 80's. A phosphate mill wired that they had broken a main shaft and must have one as soon as possible. So they took two old locomotive axles, split the end of one, thinned down the other and welded them together. The welding was done by an improvised drop hammer consisting of a heavy block of iron for a tup, mounted over an anvil and raised by a rope. Whether they knew it or not this is the pile driver method used in Korea and other adjoining countries. At any rate the axles were welded, then turned down to the right size, and shipped on a 3 A.M. train the same night—or next morning. This was in the days of wrought iron axles. Such welding would not go in the alloy axles of today, although arc or flame welding could probably be used with suitable preparation of the ends to be welded.

What Is the Dimension?

THE solution to George R. Shore's puzzle (*AM*—Vol. 81 page 351) is given below.

Those who have successfully answered the problem, whether by algebraic or graphical methods, are: F. M. A'Hearn, Robert L. Benson, L. C. Blomstrom, William A. Brandt, Paul Breisch, Nickolas J. Cappello, E. V. Cyran, Arnold R. Dalstrom, Orren DeWitt, Melvin C. Doul, Bertil Falck, Howard R. Finn, Perry D. Gasnier, H. A. Greenfield, H. C. Gunetti, A. E. Hartman, C. Raymond Helfrich, C. I. Hetherington, Henry M. Hunt, Lauren G. Kilmer,



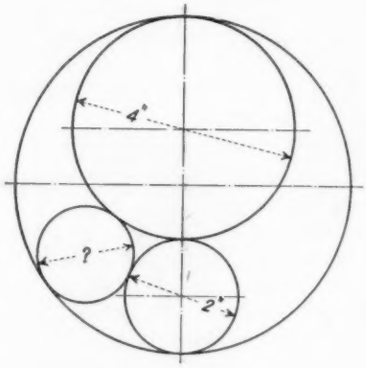
D. F. Kohler, Benton S. Larzelere, Harry D. Mahaffey, Harry J. Patterson, Joseph J. Prochazka, Fred Schmahl, G. E. Searle, Harry Silk, Ross Sinclair, W. H. Smila, Milton E. Smith, B. Spector, W. C. Sutton, Nikola Trbojevich, Ernest A. Turner, Rupert L. Usrey, Ewald Wefelmeyer, Emil Wittmann, L. O. Yeomans, Bryant S. Montgomery, H. G. Schrolucke.

What Size Plug Gage?

W. H. SMILA
Master Mechanic, Chrysler Plant, Chrysler Corporation

I BELIEVE that the puzzles recently published in *American Machinist* arouse interest among those who are mathematically minded, and I submit the following problem which is more difficult:

What size plug gage can be inserted in a 6-in. ring gage along with a 4-in. and a 2-in. plug gage, all plug gages to be tangent to the ring gage as well as to each other?



Standard Drawing Instructions

FRED H. COLVIN

FIXTURE cost has much to do with their design and use. Methods that will hold tool costs to a minimum are of vital importance in all cases. For this reason all plants that build fixtures in any quantity have a standard procedure that is adaptable to the great majority of cases.

Practice differs widely throughout industry with regard to tool drawings. Many plants still use tracings inked on cloth, others find pencil tracings on bond paper perfectly satisfactory. Blueprints are made from the tracings, the only choice seems to be in maintaining permanent records when they are necessary.

Usually the minimum-size standard sheet is of letter size, 8½x11 in., which makes it convenient for filing. Larger sheets are in multiples of the small size, as 11x17, 17x22 and 22x34 in. Tracings and blueprints of these sizes are conveniently folded for filing or mailing.

Practice of the Taft-Peirce Mfg. Company, Woonsocket, R. I., is to make all drawings with pencil on bond paper. A standard 8½x11 in. sheet is used for this purpose. Instructions given tool designers at this plant include the following:

Bond paper is used for all drawings unless otherwise ordered; lines, etc., to be made as follows:

Visionary or subject lines—Fine red pencil.

Tool outlines—Very heavy sharp pencil line.

Margin lines—Very heavy solid black pencil line ¼ in. from edge of paper.

Center lines—Solid fine pencil line.

Witness and dimension lines—A fine pencil line.

MONEY SAVERS
for 8 years—
in the R. HOE PLANT
Super Service
RADIALS

The piece shown is 2¼" x 5¾" x 18½" long.

Operations in sequence include:

1—Drill and Tap four ⅝" holes, two 21/32" holes.

2—Drill and Tap four ½" holes, two 3/16" holes, ½ CT. bore.

3—Drill one 31/32" hole in one end.

4—Drill one 31/32" hole in other end.

EIGHT Super-Service Radials have been time and labor savers for eight years on a large variety of work for R. Hoe & Co., Inc., New York City.

The 5 ft. machine shown in the close up handles drilling and tapping operations on a cast iron knife support for a Flat Shaving Machine. Working to limits of +—.002", the time per piece is only 45 minutes.

You, too, can speed up production by handling drilling and tapping on Super-Service Radials. The long service life of these machines and their maintained accuracy assure savings year after year.

Our engineers will gladly study your requirements and recommend a profitable method of handling them.

THE CINCINNATI BICKFORD TOOL CO., OAKLEY, CINCINNATI, OHIO

CINCINNATI BICKFORD

Dimension figures, arrow heads, titles, "F" marks and notes to be printed in pencil.

Figures and letters to be formed clearly, distinctly and of uniform size.

Figure all accurate dimensions, as for bushings, etc., from bedding surface of part.

Workmen should not be obliged to add, subtract, etc., in order to obtain measurements.

Dimensions and dimension lines to be outside of the outline of the part wherever practicable.

Do not repeat dimensions.

Omit dimensions in assembly when they can be given in detail.

Out of scale dimensions are to be underlined.

Omit pattern dimensions except overall dimensions, on tool drawings. Pattern maker will measure the prints, consequently detail drawings of castings must be made accurately to scale.

Detail all parts which are made especially for the job.
Group all flat work together.
Group all round work together.

Symbol numbers in pencil and enclosed in a circle are to be placed close to each part on both assembly and detail.

Notes are printed horizontally in pencil and underlined with pencil.

Titles—when not already printed on the blank sheets should be stamped with the rubber stamp form provided. Print all titles at the lower right-hand corner and have the long dimension of the paper always at the top and bottom.

Scale—When a drawing is made to any other scale than full size, the scale should be plainly indicated above its title, thus: "Scale ½ size", or "Scale 4 to 1."

Quality—Do all work neatly and keep drawings clean. This is very important.

Sizes—Drawing sizes are designated as follows:

"A" Size—8½x11	Outside Dimensions
"B" Size—11x17	
"C" Size—17x22	
"D" Size—22x34	
"E" Size—34x44	

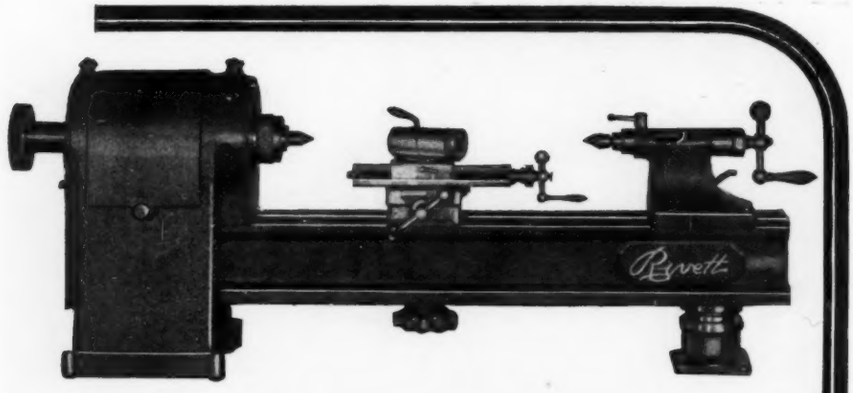
Larger sizes, special, usually 36 in. wide by any length.

Details—Keep entire job on one sheet where practicable, but where it becomes necessary to use separate sheets, try to use same size sheets. All screws, nuts, pins and other stock parts to be marked "Cyanide" or "Pack Harden" when heat treatment is required.

On part and tool drawings after making a change or correction describe same under the head of "Alterations" in the corner of the drawing, at the same time adding a small symbol letter in a circle which should correspond to a similar symbol placed close to the change in drawing.

Form tools—All circular form tools to show side clearance. The side angle of form tools to be made as slight as possible consistent with free cutting, generally from 1 deg. to 2 deg. The shape of the tools will largely determine the angle of side clearance. Angle of end clearance about 10 deg.

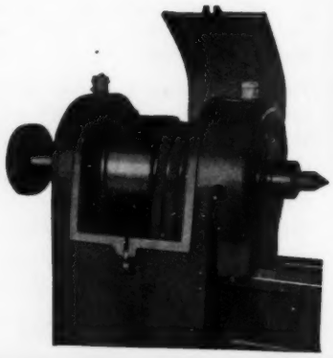
Give limits on all important dimensions both on tool and part drawings using plus and minus signs to express the amount of tolerance



RIVETT Anti-Friction Bench Lathes

Ball Bearing and Roller Bearing Spindles

COMPARE your present lathe equipments for small parts with modern Rivett Ball Bearing and Roller Bearing spindle units. Increased production is made possible by efficient drives for all purposes . . . quick start and stop . . . full power in both fast and slow range . . . higher maximum spindle speeds . . . greater operating convenience . . . sturdier construction . . . maintained precision. Improve quality and lower costs by using Rivett Anti-Friction Bench Lathes in replacement of inadequate, slow or clumsy old-fashioned tools.



with

Dynamic Balance

RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.
PIONEERS IN BENCH LATHE DEVELOPMENT

above and below the nominal figure thus: $\pm .001$ or $\frac{+.001}{-.000}$.

In specifying stock, for use on tools, call for cold rolled steel wherever practicable, as it does away with unnecessary machining operations.

If a piece is to be pack hardened and is apt to go out of shape Machinery Steel is better, having less internal strains than C. R. S.

Belt Guards in Red

ALL belt guards, in one shop recently visited, are painted a bright but pleasing shade of red. It not only adds a touch of color to the shop but calls attention to the dangerous end of the machine so that it can be easily avoided. The red paint may not be necessary, but its appearance may be well worth the cost.

Index Block for Cutting Internal Helical Teeth

CUTTING an occasional, internal helical gear presents several problems. The one shown in Fig. 1 is for a plastic mold and not for a production gear job. In that case a broach would have been used. It will also be noted that the teeth are only cut around about half the circumference.

This view shows the block in which the work is held and the tool holder, or bar, with cutting tool at *A* and the guiding groove at *B*. The tool is held in place by the setscrews in the end. Concentricity is secured by the two diameters of the tool holder. The large diameter which carries the guiding slot or cam, bears in the block and the small diameter in the index plate that also holds the piece to be cut. Fig. 2 shows how the work is clamped against the indexing plate, in the recess or counterbore which holds it against side movement.

The helical guiding groove in the tool bar fits over a guide roll in the side of the block and turns the cutting tool at the proper helix angle as it advances through the work. This cutting tool is adjusted by means of a double V.

With the work positioned in the block by means of the indexing pin

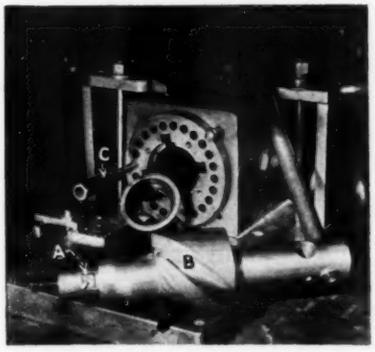


Fig. 1—A helical groove in the tool holder and a guide roll in the block establish the correct helical path of the cutting tool

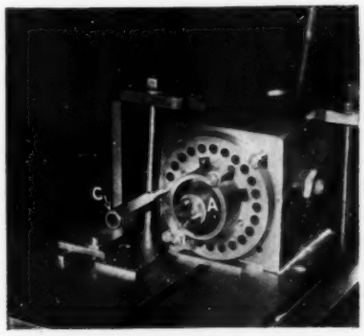


Fig. 2—Plug C is used to position the work in the block

Production Facilities that give you the widest choice of sizes and shapes including cold drawn extra wide flats up to 12" x 2" . . . *Nationwide Warehouse* service through leading distributors that cuts delivery from days to hours . . . *Metallurgical Service* that helps you solve problems of structure, machinability, tensile strength, hardness and endurance values . . . three of the important factors that make Wyckoff Cold Drawn Steel Service your logical specification.

WYCKOFF DRAWN STEEL CO.

General Offices: First National Bank Building
Pittsburgh, Pa.

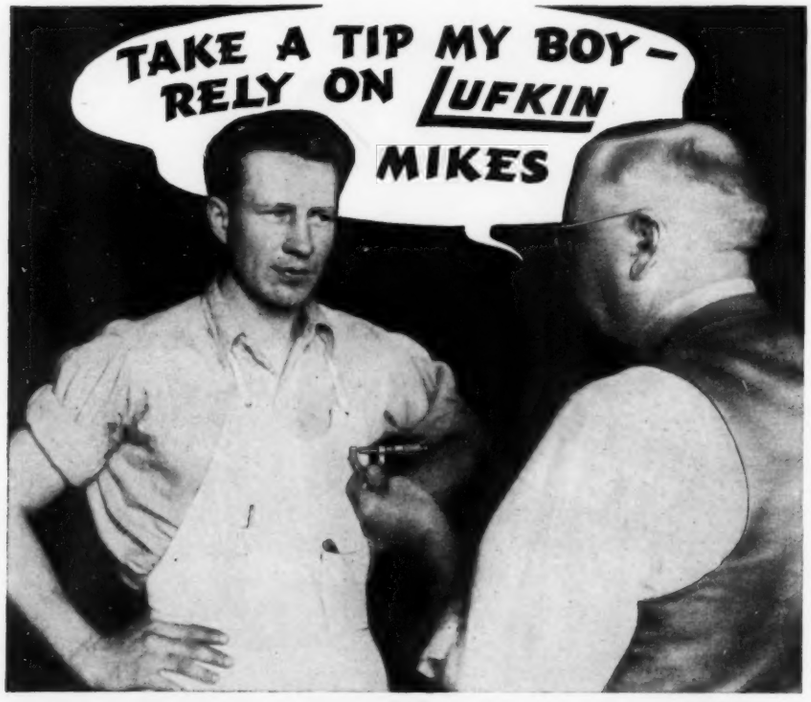
Mills at Ambridge, Pa. and Chicago, Ill.

Manufacturers of Carbon and Alloy Steels
Turned and Polished Shafting, Turned and Ground Shafting, Wide Flats up to 12" x 2"

or plug *C* the first cut is taken, the work is then indexed one hole and a cut taken in the next tooth. This is repeated for each tooth. The cutting tool is then adjusted for the next depth of cut and the process repeated for one tooth after the other. This sequence is continued until all the teeth are cut to full depth.

In making a device of this kind the cutting of the helical groove is the one point to watch carefully. If the pitch diameter of the guiding groove is the same as that of the work, the helix angle will of course be identical. But where the guiding portion of the tool bar is larger, as is desirable for rigidity, the helix angle becomes less when measured from the axis. Bearing in mind that the helix angle is in direct proportion to the radius, there will be no trouble in cutting the guiding helix correctly.

Obviously this is not a production device, but one designed for occasional use. It has proved very successful in the tool room of the National Cash Register Co., Dayton.

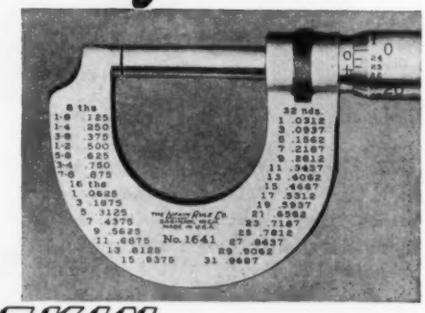


VETERAN MACHINISTS

Rely on Lufkin!

When it comes to choosing a tool to measure within ten thousandths of an inch, the best rule to follow is experience. Veteran machinists with years of experience in checking precision parts know they can rely on LUFKIN. Lufkin tool makers themselves know that only by the finest and most precise workmanship can the Lufkin reputation for dependable measuring instruments be maintained.

If you are in need of a really good mike in any size from 1" to 12" stop in at your hardware or tool store and ask to see the Lufkin line. Write for catalog No. 7.



LUFKIN

PRECISION TOOLS—TAPES—RULES

SAGINAW, MICHIGAN NEW YORK CITY

NEW BOOKS

S.A.E. HANDBOOK—1937 EDITION. *Published by the Society of Automotive Engineers, 29 West 39th St., New York. $5.00 to non-members.*

The yearly editions of this handbook, which is devoted entirely to standards and practices, is an effective refutation of the charge that standardization prevents progress. The list of changes made during the year shows clearly the care that is constantly being taken to improve current practice. It also indicates the large variety of items that come under the automotive classification. Aircraft is well represented, instruments, propeller hubs and fastenings, steels and other metals receiving attention. The list of standards is not cluttered up with obsolete items, seven specifications having been cancelled.

•

MOTOR AND CONTROL APPLICATIONS—*By George H. Hall, M. E. 259, 6x9 in. pages. Cloth binding. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York, N. Y. Price $3.00.*

This book is planned to form a complete link between the motor and control as produced by the motor manufacturer, and the tool or machine as designed by the machine builder. The author attempts to present, in a concise form, the characteristics that are obtainable from the various types of motors and the performances that may be secured from them by the selection of suitable control.

Successful selection of an electric motor and its control for the operation of any machine is dependent upon the duty which the equipment must perform. An analysis of the machine requirements must precede the determination of the capacity and type of motor to be employed.

The first chapter is given over to a discussion of the means of determining machine drive requirements, the various factors being discussed in detail. The next fifteen chapters deal with various types of motors and control apparatus, including accessories and inclosures. One chapter is given over to integral speed reducers and another to various means of connecting the motor to its work.

The next six chapters deal with various special motor applications in various fields and the final chapter lists various N. E. M. A. manufacturing standards for the more popular motor sizes.

TRADE PUBLICATIONS

AIR COMPRESSORS. Dunning Mfg. Co., Lawrence and Vine Sts., Philadelphia, has prepared a bulletin concerning its air compressors.

ARC WELDING. "The Arc-Welding of Tomorrow," is the title of booklet No. W10 released by the Harnischfeger Corp., 4200 West National Ave., Milwaukee, Wis. Action photographs illustrate the uses of various Smootharc welders.

BRASS, BRONZE AND COPPER. P. E. Conklin Brass & Copper Co., Inc., 54–60 Lafayette St., New York, is offering a 204-p. booklet which includes reference data and lists available stock.

BRAZING ALLOY. "Easy-Flo" brazing alloy and "Handy Flux" for use with the alloy are described in Bulletin No. 10, published by Handy & Harman, 82 Fulton St., New York.

CLEANING MACHINES. A four-page folder, describing the "Hypressure Jenny" cleaning machine, has been published by the Homestead Valve Mfg. Co., Coraopolis, Pa.

DEMAGNETIZERS. Circular K7 issued by the O. S. Walker Co., Inc., Worcester, Mass., includes photographs and descriptions of its various types of d.c. and a.c. demagnetizers.

ELECTRICAL CONTROL APPARATUS. Allen-Bradley Co., Milwaukee, Wis., has published price sheets for insertion in its catalog on controlling apparatus. Bulletin 609 describes a hand-operated starting switch.

EMPLOYMENT. Booklet No. 21, in a series of booklet-editorials by Allen W. Rucker in collaboration with N. W. Pickering, on the subject "Productivity As A Remedy for Inflation," has been published by Farrel-Birmingham Co., Inc., Ansonia, Conn.

FRICTION CLUTCHES. A 4-page bulletin issued by The Carlyle Johnson Machine Co., Manchester, Conn., describes standard Johnson friction clutches.

GEARS. "Red-Ring" equipment for shaving, lapping, checking and sound-testing gears are described in a folder offered by National Broach & Machine Co., Shoemaker and St. Jean Sts., Detroit.

GEARS AND REDUCERS. The second edition of Catalog No. 36, announced by The Ohio Gear Co., 1333 East 179th St., Cleveland, Ohio, lists stock sizes of gears, racks, worms, worm wheels, cams, jaw clutches, speed reducers, and other products. An 18-page appendix includes tables of frequently used information.

GRINDING MACHINES. A 4-page illustrated price list which is effective April 20, has been issued by Samuel C. Rogers & Co., Buffalo, N. Y. The price list covers the company's line of automatic knife and saw grinding machines.

GRINDING WHEEL GRADER. A 6-page bulletin, published by Abrasive Engineering Corp., Stephenson Bldg., Detroit, describes the "Grade-O-Meter" for grading grinding wheels.

LATHE. South Bend Lathe Works, South Bend, Ind., offers Catalog 96, describing the 1937 Series N and Series R precision lathes.

LATHE OPERATIONS. Atlas Press Co., Kalamazoo, Mich., has released its "Manual of Lathe Operation." This 272-page manual gives technical data for machining metals and plastics. Price: $1 per copy.

Solid Ramways bring rigid cutting • • • long life and accurate performance to Cincinnati Shapers.
THE CINCINNATI SHAPER COMPANY, CINCINNATI, OHIO
SHAPERS • SHEARS • BRAKES

LIGHTING EQUIPMENT. Catalog Section 61-180, issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., describes the types of industrial lighting equipment available for use with 200- and 400-watt high-intensity mercury vapor lamps.

LIGHTS AND FIXTURES. The Fostoria Pressed Steel Corp., Fostoria, Ohio, has issued a "Handbook on Localized Lighting." It includes a complete list of "Localite" lighting fixtures and brackets.

MACHINE TOOL INDUSTRY. A 16-page booklet discussing the part played by the machine tool industry in the daily life of the average citizen has been published by F. Eberstadt & Co., Inc., 39 Broadway, New York.

MAGNETIC CHUCKS. The O. S. Walker Co., Inc., Worcester, Mass., has recently issued Circular W3 which illustrates all of its standard magnetic chucks. This 12-page bulletin includes data on sizes, ratings and weight of the company's rectangular, circular and swiveling type magnetic chucks.

MALLEABLEIZING. Folder No. SC-81, offered by Surface Combustion Corp., Toledo, Ohio, discusses "Malleableizing with the SC Gas-Fired Radiant Tube Heating Element."

MILLING ATTACHMENT. Bulletin M-748, offered by Cincinnati Milling Machine and Cincinnati Grinders, Inc., Cincinnati, describes the high-speed universal milling attachment.

MOLDINGS. "Stainless Steel Snap-On Moldings" is a bulletin recently issued by the Pyramid Metals Co., Chicago, Ill., which illustrates a variety of moldings available for use in industrial design.

MOTORS. Plain bearing motors which are inefficient or whose bearings have failed can be easily converted to the ball-bearing type with the Fafnir wide inner ring ball-bearing motor cartridge, described in a new circular "Plain Bearing Motors Saved" issued by the Fafnir Bearings Co., New Britain, Conn.

PIPE CUTTERS AND THREADERS. A bulletin recently published by The Curtis & Curtis Co., 190 Garden St., Bridgeport, Conn., illustrates their pipe cutting and threading machines and some of the details of their operation. There is included a brief description of the range of uses of these machines.

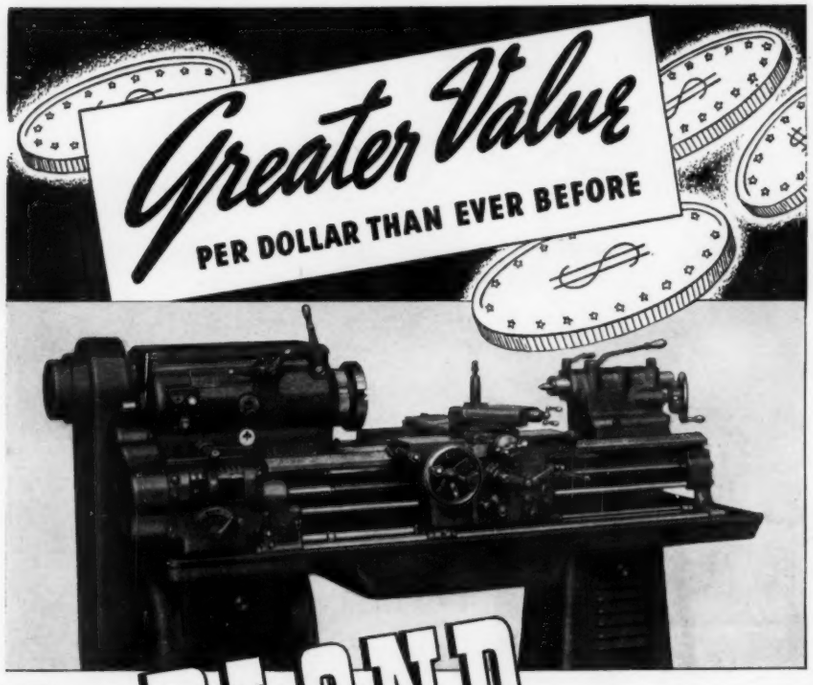
PORTABLE CLEANERS. A complete line of portable industrial cleaners is described in Folder No. BB337, offered by Ideal Commutator Dresser Co., 1439 Park Ave., Sycamore, Ill.

PRECIOUS METAL REFINING. Handy & Harman, 82 Fulton St., New York, has published a bulletin describing their facilities for refining and fabricating gold, silver and platinum and their alloys.

PULLEYS AND FLEXIBLE COUPLINGS: The Congress Tool & Die Company, Inc., 9030 Lumpkin Ave., Detroit, offers a catalog listing V-pulleys, variable-speed pulleys, step-cone pulleys and flexible couplings.

RECORDING GAGES. Bulletins No. 483 to No. 486 inclusive, offered by The Bristol Co., Waterbury, Conn., describe recording and controlling gages.

RUST ARRESTOR. Form No. 441, has been released by The Truscon Laboratories, Detroit, Mich., concerning the use of Bar-Ox Formula "97" as a rust inhibitor for iron and steel.



LeBLOND

HEAVY DUTY LATHES

If you use lathes, and are interested in effecting operating economies, improving production schedules, enjoying trouble-free, dependable performance, investigate LeBlond Heavy Duty Lathes . . . outstanding in the machine tool industry as the greatest value for your production equipment dollar. Only LeBlond Lathes provide all the modern time-, labor- and money-saving advantages that enable you to overcome today's competitive conditions. Send for illustrated literature describing in detail LeBlond Heavy Duty Lathes in all sizes 12" to 36".

Headstock construction is rugged, simple, faultless in operation, quiet, smooth-running. Gears are hardened chromium nickel steel; teeth precision cut and ground. With gear train for twelve speed changes, reverse and compounding feed gears are *also* in head, eliminating troublesome hanging brackets and gears on end of lathe.

The R. K. LeBLOND MACHINE TOOL CO., CINCINNATI, O.

20 North Wacker Drive, Chicago 103 Lafayette St., New York

REGULATORS. Marshall floating-carbon-pile regulators for automatic voltage, current and speed control, manufactured by Ideal Commutator Dresser Co., 1439 Park Ave., Sycamore, Ill., are described in a folder now being mailed.

RELAYS. Type HGA auxiliary relays are described in Bulletin GEA-2530, offered by General Electric Co., Schenectady, N. Y.

SHOP BOXES. A catalog published by Lyon Metal Products, Inc., Aurora, Ill., describes their line of steel shop boxes, shelving, lockers and tool storage equipment.

SOCIAL SECURITY. Publication No. 12 contains a list of the publications issued by the Social Security Board, Washington, D. C., as well as certain publications of other government departments concerned with the administration of the Social Security Act.

SOCKET WRENCHES. Armstrong Bros. Tool Co., 317–357 North San Francisco Ave., Chicago, has published a catalog sheet describing heavy-duty box socket wrenches.

SPEED INDICATOR. An 8-page bulletin, prepared by the Hasler-Tel Co., 461 Eighth Ave., New York, N. Y., describes the Hasler speed indicator, its uses and its limitations.

TOOLHOLDERS AND ATTACHMENTS. Toolholders and small attachments for Millholland turret screw machines are described in a six-page bulletin offered by the Millholland Sales & Machine Co., 1115 E. 35th St., Indianapolis.

TOOL STEELS. Bulletins published by S.K.F. Steels, Inc., 369 Lexington Ave., New York, describe SKF 36, SKF 46, SKF 100 and SKF 711 tool steels.

TRAMRAIL. An 8-page bulletin on "How to Plan a Materials Handling System" has been issued by The Cleveland Crane & Engineering Co., Wickliffe, Ohio. The bulletin shows different methods of handling material and is illustrated by photographs of actual installations.

TURRET LATHE. The Millholland Sales & Machine Co., 1115 E. 35th St., Indianapolis, has issued a four-page bulletin describing the No. 4-H turret lathe.

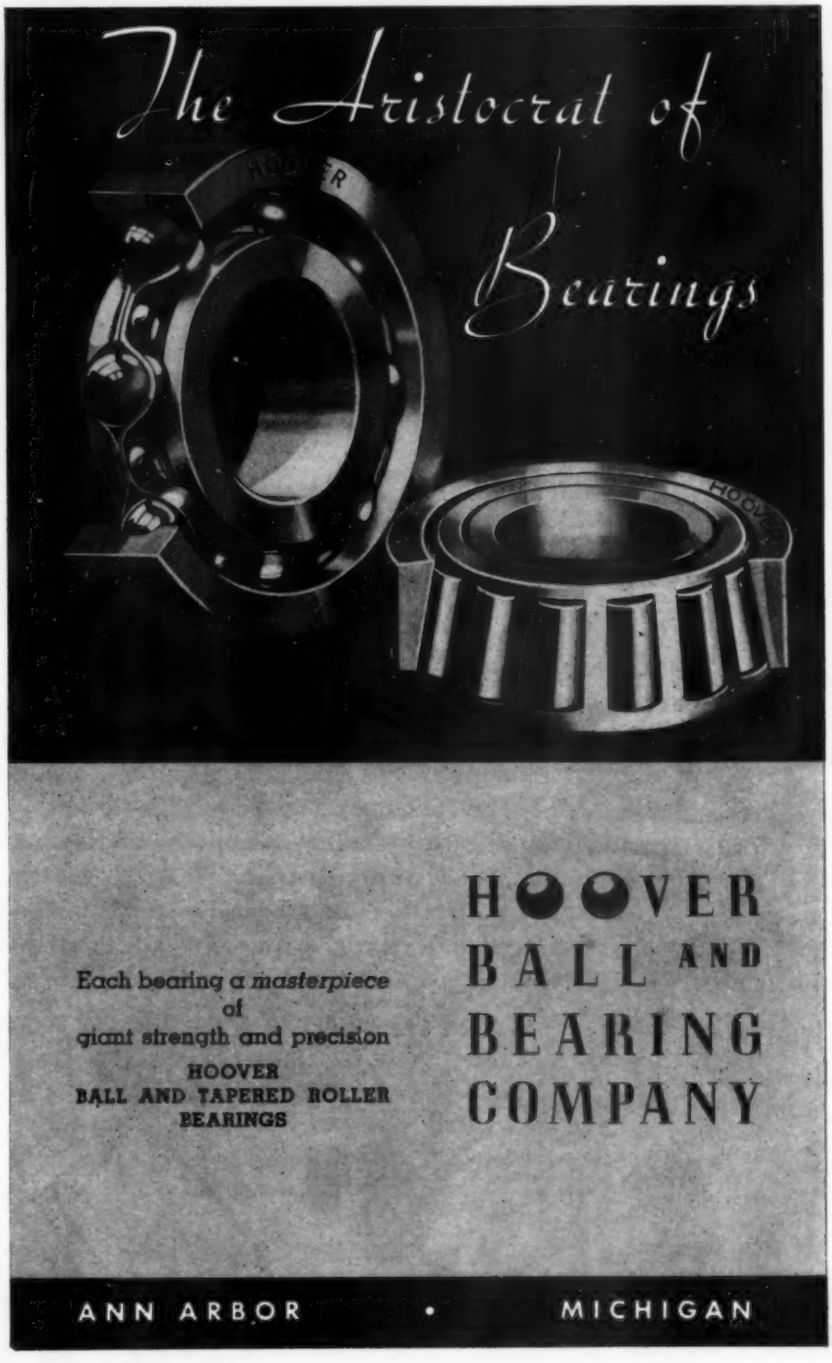
UNEMPLOYMENT. A report, "Unemployment and Increasing Productivity," published by the Works Progress Administration, 1734 New York Ave., N.W., Washington, D.C., deals with the overall changes in the nation's employment problem since 1920, and emphasizes some of the important questions which must be taken into consideration in any attempt to deal with the problems of unemployment.

V-BELT DRIVE. The Gates Rubber Co., Denver, Colo., has prepared a folder on Vulco Rope Belts.

VOLTAGE REGULATORS. Electronic automatic alternator voltage regulators, Type EF and Type EB, manufactured by Ward Leonard Electric Co., Mount Vernon, N. Y., are described in detail in Bulletins No. 5601 and No. 5602.

WELDER. A bulletin on the "Flexarc" engine-driven welder has been issued by Dept. 5-N, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. These single-operator, 200-300-400 amp. sets are described. Performance and fuel consumption curves are included.

WELDING EQUIPMENT. The new catalog of the Progressive Welder Co., 737 Piquette, Detroit, Mich., describes the company's equipment and illustrates some of the uses to which it has been put.


The Aristocrat of Bearings
Each bearing a masterpiece of giant strength and precision
HOOVER BALL AND TAPERED ROLLER BEARINGS
HOOVER BALL AND BEARING COMPANY
ANN ARBOR • MICHIGAN

SUPER PRECISION RUNS IN THE FAMILY

● IN the M-R-C family the methods and standards involved in making Super-Precision Ball Bearings are also applied to produce more uniform standard bearings. M-R-C Super-Precision Ball Bearings are necessarily limited to applications demanding extreme accuracies and speeds . . . but M-R-C Selected and Standard grades all benefit by the methods and standards used for M-R-C Precision and Super-Precision bearings.

Because M-R-C Super-Precision Bearings are the world's finest ball bearings . . . all M-R-C Ball Bearings are better bearings. The M-R-C engineering department is a source of advanced bearing data . . . their suggestions are available without obligation to any ball bearing user.

MARLIN-ROCKWELL CORPORATION

Executive Offices: JAMESTOWN, N. Y.
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M-R-C *Ball Bearings*

GURNEY ● SRB ● STROM